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Abstract
The 2015 series of RIO Country Reports analyse and assess the policy and the national research and innovation system developments in relation to national policy priorities and the EU policy agenda with special focus on ERA and Innovation Union. The executive summaries of these reports put forward the main challenges of the research and innovation systems.

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Foreword

The report offers an analysis of the R&I system in Greece for 2015, including relevant policies and funding, with particular focus on topics critical for EU policies. The report identifies the main challenges of the Greek research and innovation system and assesses the policy response. It was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites etc. The quantitative data is, whenever possible, comparable across all EU Member State reports. Unless specifically referenced all data used in this report are based on Eurostat statistics available in February 2016. The report contents are partly based on the RIO Country Report Greece 2014 (Tsipouri and Athanassopoulou, 2015).

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Executive summary

Context

After the financial and sovereign debt crises and five years of severe austerity measures, Greek GDP had declined by 23.8% at the end of 2013 compared to 2008. In 2015, GDP was forecast to shrink further by 1.4% in the same year, and by 1.3% in 2016[1]. The unemployment rate is the highest in the EU and has steadily increased during the crisis until 2014, when it fell slightly to 26.5%.

Austerity policies entailed severe budget cuts in all policy areas, also affecting public R&I spending. As a consequence, lack of funding is currently a critical issue the Greek R&I system faces. However, despite new fiscal consolidation commitments associated to the 3rd Economic Adjustment Programme agreed in July 2015, the government has announced measures to safeguard funding for implementation of research projects.

R&I as a topic has moved more into the focus of government announcements since the Tsipras administration took office in January 2015, but was never a central issue in socio-economic policy planning. The R&I share of the public budget was low already before the crisis and is very strongly dependent on Structural Funds and foreign competitive funding. Greece is a moderate innovator, performing at 66% of the EU median innovation index in 2014, a 5 percentage point drop from 2013[2].

In 2014, the R&D intensity target for 2020 was raised to 1.21% of GDP, after having been reduced from 2% to 0.69% in 2013 in the face of continuing budget austerity. GERD stood at 0.83% of GDP in 2014, having steadily increased since 2011 (0.67%). R&D funded by the business sector was 0.25% of GDP in 2014, and BERD has slowly increased (2011-2014) to 0.28% (EU-28 average: 1.3%).

Key developments in the R&I system in 2015 included:

- Creation of the position of Alternate Minister for R&I within the Ministry of Education, Research and Religious Affairs; and of a corresponding R&I sector at the ministry
- Release of the national smart specialisation strategy, which so far is the document containing most measures to support private R&D, innovation, and public-private cooperation planned for 2015-2020
- Kick-off of the creation process of a National Roadmap for Research Infrastructures
- Adoption of the national and regional smart specialisation strategies
- Designation of the General Secretariat for Research and Technology (within the Ministry of Education, Research and Religious Affairs) as evaluation and certification authority for R&I projects

Greek policy favours international cooperation in publicly-funded research. Greek research teams participate extensively in ERAnets and other EU initiatives and often play important roles in research agendas for grand challenges. The labor-market for researchers in Greece is heavily regulated with strict remuneration rules that reward seniority rather than performance. Due to the severe budget cuts in the past years, working conditions have strongly deteriorated in the public research sector, rendering Greece unable to attract talented researchers from abroad and leading to increasing brain-drain.

Collaboration between academia and the business sector is very limited due to different organisational cultures and the lack of demand from the business sector. Academia-industry co-publications accounted for 1.5% of total publications in the period 2011-2013. A variety of public and private initiatives to support knowledge transfer exists, but most of them suffer from limited funding.

[1] European Commission (2015a) European Economic Forecast Autumn 2015.
[2] European Commission (2015b) Innovation Union Scoreboard 2015.

The identified challenges for Greece's R&I system are:

(1) Unstable and inefficient R&I governance structure with a particular weakness in evaluation

(2) Inefficiency and lack of prioritisation in funding allocation

(3) Extremely low R&I activity in the private sector

R&I Challenges

Challenge 1: Improve R&I governance, in particular evaluation mechanisms

Description

The Greek R&I governance system has long been characterised by a lack of strategic vision and weak coordination between governmental bodies[3]. An Innovation Council including representatives from academia and industry was set up in 2013 to provide R&I advice on strategic level and facilitate coordination between government agencies responsible for R&I activities and stakeholders. However, it produced very few recommendations and decisions so far[4]. Supervision of the General Secretariat for Research and Technology (GSRT), the main body responsible for policy implementation and funding, was transferred back and forth twice from the Ministry of Development, Competiveness, Infrastructure, Transport and Networks to the Ministry of Education and Religious Affairs between 2009 and 2012. These shifts created inefficiencies and delays in policy implementation.

Until 2013, no systematic evaluations of policies and funding programmes were carried out, which means the knowledge base for policy learning and improvement is still very small. Universities and public research organisations are regularly evaluated, but evaluation results are not taken into account for budget allocation[5]. Reporting of statistical indicators related to R&I was was not systematically organised and led to lack of data from 2011 to 2013, leading to discontinuities in time series that complicate performance analysis.

Policy response

In February 2015 the government created the post of Alternate Minister for research and innovation within the Ministry of Education and Religious Affairs and established an R&I sector within the ministry in March. This role is expected to bring more top-level political guidance to R&I governance. After the September 2015 elections, the Ministry was renamed "Education, Research, and Religious Affairs", which may signal a commitment to put more emphasis on R&I.

A draft National Strategy for Research, Technological Development and Innovation (ESETAK) was adopted in 2014. In terms of planned programmes ESETAK is identical with the national smart specialisation strategy, but this may change in the future. A law to implement it was passed the same year, but has been under revision at the initiative of the Alternate Minister for R&I since spring 2015. Among other things, the revision aims to redefine evaluation regimes, improve working conditions for publicly employed researchers, and to facilitate timely absorption of SF funding. Furthermore, the country's high-level advisory body, the National Council for Research, Technology Development and Innovation (NCRTDI), is to provide recommendations on the formation of the national R&I strategy. The revisions emphasise the need to establish it in a non-bureaucratic and transparent way. Furthermore, Regional Research and Innovation Councils are to be created, which will have a major role in implementation of RIS3 strategies. They are intended to provide the link between GSRT's policy implementation at the national level and regional smart specialisation.

[3] OECD (2014) OECD Science, Technology and Industry Outlook 2014, OECD Publishing, Paris.
[4] Tsipouri, Lena and Sophia Athanassopoulou (2015) RIO Country Report Greece 2015.
[5] Ibid.

ESETAK and the corresponding implementing law introduced new methods to evaluate RPOs. Evaluations will take place every 5 years by committees of 5-7 (Greek and foreign) external evaluators. In 2015, GSRT was tasked also with project and programme evaluation, until it had completed creation of a registry of certified evaluators, which would then take over these responsibilities. The National Documentation Centre has started to regularly evaluate funding programmes. It has also embarked on a more systematic monitoring of the R&I system, with regular publication of related data and results. Problems with reporting statistical indicators have been resolved with a reorganisation of data collection mechanisms in 2013.

Assessment

An assessment of the new R&I strategies' impact is not yet possible, as the corresponding law is still under revision which effectively stalls the implementation process. The changes in the R&I governance structure proposed in ESETAK have been judged largely positively by the European Commission as well as by independent consultants[6], but it remains to be seen to what extent these recommendations are modified in the ongoing revision. Continuing political instability might delay swift implementation of institutional changes. At the same time, severe budget cuts and personnel reductions negatively affect staff motivation for organisational change within government agencies[7].

Regarding evaluation and policy learning, the monitoring and data publication activities of the National Documentation Centre are a step in the right direction. However, the extent to which these results will influence policy making is not clear yet. For this aspect, design and implementation of new evaluation mechanisms mandated from GSRT will likely be crucial. Mandatory evaluations in the context of Structural Funds Operational Programmes may in the longer term also improve evaluation culture in general. The Evaluation Plan submitted to DG Regio, which is mandatory for the current Programming Period (2014-2020) lists a number of RTDI evaluations at national and regional level. They are not expected to start before 2017.

Challenge 2: Increase focus and prioritisation in funding allocation

Description

At the funding level, complex administrative rules, inefficient management structures, and low administrative capacity limit the system's efficiency. Most importantly under the current austerity regime, funding decisions lack focus and prioritisation.[8] Structural Funds represent a large share in Greece's R&D expenses (20.8% in 2012). The amount of funding that could be acquired appears to have sometimes superseded the expected impact of projects as a decision criterion. This led the administration to often follow broad EU Framework Programme priorities without much regard as to how well these matched national and regional needs.

The absorption rate of Structural Funds over the 2007-2013 period was 51%, which put Greece at 11th rank (EU27 average: 42%).[9] However, since the onset of budget austerity, absorption has become increasingly problematic due to the Greek government's difficulty to provide sufficient co-financing.

[6] European Commission (2014a) European Semester Staff Working Document Greece 2014; Boston Consulting Group and Foundation for Economic and Industrial Research (2014) The role of structural reforms and the prospects for the Greek economy.

[7] Tsipouri, Lena and Sophia Athanassopoulou (2015) RIO Country Report Greece 2015.

[8] European Commission (2014a) European Semester Staff Working Document Greece 2014.

[9] Katsarova, Ivana (2013) The (low) absorption of EU Structural Funds. Library Briefing, Library of the European Parliament, 01/10/2013.

The lack of prioritisation has been an obstacle to achieving economies of scale or critical mass in research areas where the country is strong. It also constrains the potential for science-business cooperation, as it reduces the range of attractive cooperation partners on both sides[10].

Policy response

In the Ministry for Economy, Development and Tourism, two deputy minister posts were created for entrepreneurship and for managing the National Strategic Reference Framework for funding allocation. As regards funding allocation, the National Strategic Reference Framework for 2014-2020 (following the Structural Funds programming cycle) explicitly prioritises mostly areas where Greece has a competitive advantage, namely tourism, agriculture, logistics, health, ICT, creative industries and culture; as well as environment, energy, and materials. These priorities are also set out by the national R&I strategy ESETAK. On the public research side, the university reform programme Plan Athena is being implemented since 2013. It aims at making HEIs and PROs more efficient, above all by incentivising greater specialisation on local research strengths and elimination of redundancies between research institutes.

Smart specialisation strategies have been developed since 2013 for all Greek regions. They were mostly drafted by independent consultants and are now at various stages in the process of entrepreneurial discovery process and peer review. All regional strategies and the national strategy were adopted in 2015. Definitions of priority areas are being developed further in regional action plans, which also detail investment areas and monitoring/evaluation mechanisms.

To facilitate access to remaining funds allocated for 2007-2013, the 3rd Economic Adjustment Programme (EAP) provides for a significant easing of co-financing requirements, conditional on Greece's fulfilment of a list of ex-ante obligations. The EAP was scheduled to enter into force mid-October 2015. The co-financing issue has also been a focus in the RIS3 peer review of Eastern Macedonia and Thrace, the structurally weakest region of Greece[11].

Assessment

The influence of the new Deputy Ministers for funding allocation and entrepreneurship will only be possible to evaluate after a few years.

Smart Specialisation seems to be viewed by the national and regional administrations as having high potential to drive structural transformation and help exiting the economic crisis, thus political commitment to this process is high[12]. The number of national specialisation priorities appears rather broad, but priorities in regional strategies have been already more concrete and specific. It remains to be seen how well the national strategy integrates the regional ones, and how well its implementation will be monitored. Positive signs are that it lists planned instruments to finance the support of private R&I investment according to the regional strategies, and that it sets out detailed financial requirements for these initiatives. A limiting factor might prove that regional authorities can decide on the allocation of only a small share of SF funds.

Challenge 3: Nurture private R&I activity and remove related obstacles

Description

Business demand for R&D, as well as private spending on research and innovation, is low compared to other EU Member States of similar size and development.

[10] European Commission (2015c) Communication COM(2015)400 "A new start for jobs and growth in Greece".
[11] S3 Platform (2015) RIS3 Peer Review Summary Report Eastern Macedonia and Thrace.
[12] Tsipouri, Lena and Sophia Athanassopoulou (2015) RIO Country Report Greece 2015.

BERD stood at 0.28% of GDP in 2013, placing Greece at 21% of the EU median[13]. Nevertheless, this represents a recovery to €489m after a sharp drop down to €459m in 2012.

Sectors with relatively high innovation performance have focused mainly on organisational and marketing innovations[14]. Greece occupies rank 5 in the corresponding IUS indicator. It also scores high on knowledge-intensive services exports (rank 7), which is largely due to the sizable share of maritime transport in the economy. The country lacks world-leading corporate R&D investors, with only three firms among the top 1000 EU companies that invest in R&D[15]. In 2014, some multinational companies headquartered in Greece expressed their intention to relocate if political instability continues, which further depresses the outlook for BERD[16]. The acquisition of 2.5% of total FP7 funds by Greek applicants (rank 11, almost on par with Denmark and Austria) seems to have been unsuccessful in inducing more private R&D activity.

A main factor that currently constrains business R&D expenditure is the low financial liquidity of SMEs (which make up 99.9% of all companies) and persistently low lending from banks, many of which are undercapitalised and grapple themselves with liquidity problems. 42% of SMEs reported access to finance to be their most pressing problem in 2013/2014[17]. Private equity is not an alternative source of funding, with private venture capital levels and business angel investments both close to 0% GDP in 2013[18]. While access to funding may currently be the largest obstacle to private sector R&D, institutional deficiencies also play a role, above all regulatory framework conditions unfavourable to risky entrepreneurial activity, and a complex and inefficient system of public support for private R&I. The latter issue is compounded by the capacity deficit of SMEs and regional research organisations for navigating application procedures and drawing up good grant applications.

The root of this challenge lies thus largely on the demand side. The Greek public research system performs more or less on EU average in terms of excellence. It scored 55.27 on highly cited publications in the Excellence Composite indicator in 2012 (EU average 55.38) and 81.31 on ERC grants (EU average 81.77) – although budget austerity is jeopardising the sustainability of research excellence. Nevertheless, commercialisation of research results is another weak aspect of the country's R&I system that contributes to the low private R&I activity. Public support for commercialisation activities within HEIs and PROs is low and there are no incentives for individual researchers to engage in entrepreneurship or cooperation with industry[19]. While there are a number of "venture cup" type competitions and measures to support spin-offs, business ideas often do not reach a stage where they would become commercially viable. This is due both to insufficient funding of such instruments and failure to support a more entrepreneurial culture in public research organisations.

Policy response

The government recognises low private R&I activity as a significant challenge and has included it among the objectives of the 2015 National Reform Programme. The Operational Program for Competitiveness, Entrepreneurship and Innovation currently being drafted will include new measures to promote business R&I investment.

[13] European Commission (2015b) Innovation Union Scoreboard 2015.
[14] National Documentation Centre - EKT (2015) Innovation in Greek enterprises 2010-2012. Athens.
[15] OECD (2014) OECD Science, Technology and Industry Outlook 2014, OECD Publishing, Paris; European Commission (2015d) The 2015 EU Industrial R&D Investment Scoreboard.
[16] Tsipouri, Lena and Sophia Athanassopoulou (2015) RIO Country Report Greece 2015.
[17] European Central Bank (2014) Survey on the access to finance of small and medium-sized enterprises in the euro area, October 2013 to March 2014.
[18] EBAN – European Trade Association for Business Angels (2014) Statistics Compendium 2014; EVCA – European Venture Capital Association (2015) Central and Eastern Europe Statistics 2014
[19] Directorate-General for Economic and Financial Affairs (2014) The Second Economic Adjustment Programme for Greece - Fourth Review. Occasional Papers 192.

The development of RIS3 priority areas is also intended to support and grow the specific strengths of regional private R&I performers. Cross-cutting strategic priorities of the RIS3 process explicitly include support to increase private R&I investment, development of an innovation culture, and the fostering of knowledge transfer and open science. The national RIS3 strategy provides for a concrete measure to support commercialisation, namely a public-private Patent Pool Fund (co-financed through ERDF), which will be implemented if and when the background study required by the financial instruments regulation has been completed..

Several instruments in the 2014-2020 programming period have been outlined in the national RIS3 strategy and are supposed to be operationalised through the OP for Competitiveness and Entrepreneurship. However, no new calls for the programming period 2014-2020 have been issued yet. Among others, there will be a grant scheme for supporting establishment and development of innovative start-ups (indicative budget €540m), a programme supporting innovative clusters where business collaborate with academia (€300m), and a grant scheme to support private RTDI projects (€318m). Within the overall envelope of €20b of European Structural and Investment Funds available to Greece for 2014-2020, €1.3b has been earmarked for investments in research and innovation, with which extensions of some of the measures mentioned above are planned to be co-financed[20].

Tax rebates on R&D expenses were introduced in 2013. R&D expenses of up to 30% of taxable income can be deducted, with the total amount of deductions spread over 3 years. Since 2010, profits derived from patented products and services are tax exempt for a period of 3 years.

To counteract the lack of investment capital for SME R&D, the Greek government established a fund for regional development and innovation in cooperation with the German state-owned development bank KfW in 2014 (€100m contribution each). The Onassis Foundation will contribute an additional €30m to the fund. There are currently 4 public-private innovation funds co-financed through JEREMIE with a total capital of about €47m.

Assessment

The direct support programmes listed above have not yet been launched. In some cases, it seems doubtful whether the relatively high indicative budgets of individual instruments will be actually attained, especially given the strong reliance on co-financing from Structural Funds. R&D tax incentives' effects will only be possible to be assessed robustly once more companies register again profits of a sizable amount. Any measure to support private R&I investment will only have lasting effects if bank lending, equity supply, and company liquidity pick up again.

The RIS3 Action Plans being developed provide for private R&I support that is better targeted to regional industry's needs and capacities, and thus hold potential for effectively boosting business R&I activities.

Structural reforms in competition regulation, labour market legislation, and taxation have been announced or are being carried out at present, but it is too early to judge how far these changes will go and in how far they will improve framework conditions for R&I investment.

[20] European Commission (2015c) Communication COM(2015)400 "A new start for jobs and growth in Greece".

1. Overview of the R&I system

1.1 Introduction

Greece is a mid-sized member-state, ranking 10th in the EU, with a total population of about 11m people in 2014, accounting for 2.2% of EU-28 population. At the end of 2014, GDP per capita was at €16,200, i.e. 59.1% of the EU-28 average. It had been in continuous decline from €20,700 in 2009 to 16,500 in 2012[21]. Before the financial crisis (2007), Greece presented an above EU-average GDP growth, but has suffered a heavy uninterrupted recession ever since. Predictions of 2.9% growth in 2015 were revised to a decline of 1.5%-2% [22].

The budget deficit was the main cause of the Greek economic crisis. Following a 5-year austerity programme it decreased to 3.6% of GDP in 2014 compared to 12.4% in 2013 affected by the one-off costs of bank recapitalisation (10.5% GDP). The lower than expected tax revenues by €5.1b towards the end of 2014, along with political uncertainty, resulted in a primary surplus of 0.4% GDP at the end of 2014, well below the previous estimate of 1.8%[23]. Government debt remains high at 178.6% of GDP, more than 12% higher compared to 2012. The share of debt increase is mainly due to the decline of GDP.

The unemployment rate is the highest in the EU and has steadily increased during the crisis, passing from 24.5% in 2012 to a peak of 27.5% in 2013. At the end of 2014, unemployment decreased slightly to 26.5% for the first time since 2008. Approximately three quarters of the unemployed have been unemployed for over a year[24]. This is combined with a decrease in the number of employers and SMEs, while employment in bigger companies with more than 50 employees increased in 2013 by 2.5% compared to 2008[25]. The sectoral composition indicates overrepresentation of agriculture and the public sector and a considerable underrepresentation of manufacturing and in particular high tech manufacturing, compared to the EU average. Employment in knowledge intensive sectors remained steady at about 37% of total employment in the period 2012-2014. Gross Added Value is concentrated in trade and tourism (24.3%)[26]. Manufacturing accounts for 20.7% of Gross Value Added.

Greece ranks fifth from the bottom among all EU member states in terms of R&D intensity. At the end of 2014, GERD was at €1.489, increasing from 0.67% of GDP in 2011 to 0.84% of GDP in 2014. However, the rise is largely attributed to a decreasing denominator rather than a massive increase of R&D spending. The R&D intensity target is set at 1.21% of GDP by 2020. In order to reach this target, GERD would have to increase by 6% in the period 2013-2020, compared to an average annual growth of 2.8% in the period 2004-2013 and an average annual growth of 4% in the period 2007-2013[27]. BERD/GDP is also persistently among the lowest in the EU at 0.28% (2014). The economic crisis that has deteriorated the performance of the business sector has inevitably influenced business-financed R&D. Publicly-financed business R&D is limited as spending in the new programming cycle has not started yet. The target for BERD/GDP in 2020 is 0.38%[28].

[21] Eurostat, GDP (nama_gdp_c)
[22] The Greek Economy 03/15 (October 2015), Quarterly Report, Vol. 81, Foundation For Economic and Industrial Research, pg. 17
[23] Greek National Reform Programme, April 2015, pg. 10
[24] Greek National Reform Programme, April 2015, pg. 11
[25] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, pg. 18
[26] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, pg. 16
[27] European Commission, EUROPEAN SEMESTER THEMATIC FICHE RESEARCH AND INNOVATION, pg. 12
[28] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, pg. 129

Turnover from innovation accounted for 11.9% of total turnover (2012 data), compared to the EU-28 average of 11.8% and placed Greece in the 11th position among EU-28 Member States along with the Netherlands[29]. However, this indicator needs to be interpreted with caution, since innovation in the country is mainly incremental and not technologically based.

The national political and economic system of Greece was destabilised in 2015 with two elections and a referendum, the expiration of the 2nd Economic Adjustment Programme in June 2015, the shortage of funding and capital controls imposed in July 2015. This led to intense negotiations with the lenders for a 3rd Economic Adjustment Programme, which resulted in a Memorandum of Understanding signed in August 2015 providing for a European Stability Mechanism (ESM) financial assistance of €86m for the period 2015-2018.

R&I remains a priority for the Greek government, as marked by the completion of the National Strategy of Research and Innovation for Smart Specialisation 2014-2020. The coalition government dominated by the left party Syriza has announced major reforms in the education and research system, which have not yet taken a final shape. The draft law on education, which foresaw major governance changes in tertiary education, has been strongly opposed by the academic community and was withdrawn. A new law on research and innovation is expected soon. A cabinet minister for research and innovation has been appointed for the first time under the current government. In spite of the capital controls, the government introduced measures to safeguard the implementation of research projects[30].

Table 1 Main R&I indicators 2012-2014

Indicator	**2012**	**2013**	**2014**	**EU average**
GDP per capita	17,500	16,500	16,200	27,300 (2014)
GDP growth rate	-7.3	-3.2	0.7	1.4 (2014)
Budget deficit as % of GDP	-8.7	-12.4	-3.6	86.8 (2014)
Government debt as % of GDP	159.4	177.0	178.6	-3.0 (2014)
Unemployment rate as percentage of the labour force	24.5	27.5	26.5	10.2 (2014)
GERD in €m	1,337.6	1,465.7	1,481.8	283,009 (EU28 total)
GERD as % of the GDP	0.7	0.8	0.8	2.03 (2014)
GERD (EUR per capita)	120.3	133.3	135.6	558.4 (2014)
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	1.3	1.2	1.2	5.7 (2014)
Employment in knowledge-intensive service sectors as share of total employment	36.3	36.7	36.2	39.8 (2014)

[29] Eurostat- Turnover from Innovation as % of total turnover (tsdec340)

[30] R&I sector, Summarised Review, March 2015-August 2015, Ministry of Culture, Education and Religion, pg. 4

Indicator	2012	2013	2014	EU average
Turnover from innovation as % of total turnover	11.8	n.a	n.a	11.9 (2012)
Value added of manufacturing as share of total value added	21.7	20.7	n.a	26.2 (2012)
Value added of high tech manufacturing as share of total value added	1.0	1.5	n.a	2.5 (2012)

Source: Eurostat

1.2 Structure of the national research and innovation system and its governance

1.2.1 Main features of the R&I system

The R&D system in Greece is centralised. The General Secretariat for Research and Technology (GSRT), part of the Ministry of Education, Research and Religion, has the leading role in designing and implementing the national policy on R&D. Limited research budget lines allocated to the regions were in the past transferred to the GSRT, which launched central calls and selected proposals complying with the budget lines transferred to each region. This is, however, changing in the current programming period (2014-2020), as Regional Authorities have designed their own Smart Specialisation Strategies, which will be implemented in the Regional Operational Programmes in parallel with competitive calls from the national Operational Programme for Competitiveness.

The system is dominated by public funding. The public sector funded over 50% of total GERD in the period 2012-2014, steadily increasing to 53.6% at the end of 2014. Industry-financed GERD accounted for 30.3%, HERD (excluding GUF) or 2.6%, private non-profit less than 1%, and the rest of the funding (13.4%) came from abroad. Among the EU-27, Greece ranked 7th in terms of number of applicants to FP7 programmes and 7th in terms of requested EC contribution[31]. Funding from abroad was principally allocated to HEIs (almost 40% of total) and public research organisations (30.8% of total).

The Law on Research, Technological Development and Innovation (L.4310/2014), acknowledges the pivotal role of GSRT in the design of R&D programmes and the allocation of funding, but envisages also the creation of Regional Research and Innovation Councils (RRIC), which will have a major role to play in regional policies and cooperate with the GSRT in strategy formulation, networking and R&D collaborations in the regions. As yet Regional Councils are appointed in few regions only and the overall governance structure will be crystallised after the Smart Specialsiation Strategy has been fully operational and the expected new law on R&I adopted by the Parliament. This is foreseen for the first semester of 2016.

HEIs are the major driver of research activities, despite significant budget reductions throughout the crisis. The best performing HEIs and PROs rely significantly on competitive foreign funding and business contracts for their continuity.

Micro and small medium companies account for 99.6% in terms of total number of enterprises, while employing 85% of the national work force. Companies involved in knowledge intensive services account for only 18% of business activity in terms of total number of enterprises compared to an EU average above 30%[32].

[31] Innovation Union Competitiveness report 2011, Country profile – Greece (European Commission, DG for Research and Innovation, 2011)

[32] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, pg. 15

Multinationals play a limited role in the national economy, which has been diminishing during the long recession. Very few of them are active in R&I in the country. The best business R&D performers are a few large Greek companies in the food, ICT and pharma sectors.

1.2.2 Governance

R&I is central in the political announcements but was never really at the heart of economic policy. The share of public budget devoted to R&I is low and it has always been, but is even more after the crisis, depending on Structural Funds and foreign competitive funding. The multi-annual planning is now determined by the Smart Specialisation Strategy. Stakeholder consultation and networking with the social partners has developed over the years and the regional and local authorities are increasingly involved. The civil society remains rather distant, anxious about poverty concerns and less so about R&I.

The National Council for Research and Technology (NCRT) is the supreme State advisory body for formulating and implementing the national policy for research, technology and innovation[33]. It is composed of top Greek scientists within the country as well as Diaspora Greeks. The NCRT proposes guidelines in the area of research and technology, assesses candidacies for directorship appointments in national research organisations, provides ad hoc recommendations to the Ministry of Education, Research and Religion The alternate Minister of R&I nominates the members of NCRT for a three-year period. The last nominations were awarded in 2014. The mandate of NCRT members was extended by Law 4327/2015 (Art.30) in May 2015, until the vote on a new law on R&I[34].

RTDI policy design is the responsibility of the new R&I Sector which started operating in March 2015 in the Ministry of Education, Research and Religion, following the creation of the position of an Alternate Minister of R&I. GSRT remains the competent administrative unit with the following responsibilities:

- Design national R&I policies (policy design function)
- Implement measures of public R&I funding (research council function)
- Provide funding and monitor the main public research organisations[35]
- Represent the country in international research policy organisations, fora and bilateral agreements.

The Management Authority for the Operational Programme of Competitiveness implements the corresponding funding schemes.
Law 4327/2015 extended the term of NCRT and specified the ESIF intermediaries for RTDI programmes.

The General Secretariat of Education and Life-Long Learning of the Ministry of Education, Research and Religion designs and implements programmes for basic research and capacity building (Heraclitus II, Aristeia II, and PostDoc).

Other public organisations relevant for R&I governance include:

- The Ministry of Economy, Development and Tourism through the Secretariats for Public Investments (NSRF) and the General Secretariat of Industry (GSI), which has traditionally supported entrepreneurship. GSI was moved back and forth during the two elections but is now back to the Ministry of Economy, where it is expected to play a major role in the promotion of entrepreneurship.

[33] http://www.gsrt.gr/central.aspx?sId=106I465I1173I646I438202, December 2014
[34] R&I sector, Summarised Review, March 2015-August 2015, Ministry of Culture, Education and Religion, pg. 4
[35] http://www.gsrt.gr/central.aspx?sId=120I438I1149I646I493483, http://www.gsrt.gr/central.aspx?sId=120I438I1148I646I493472, December 2014

- The Ministry of Rural Development and Food which supervises the National Agricultural Research Foundation (NAGREF). NAGREF undertakes research and technology in Greece in agricultural, forest, animal and fish production, the protection of crops, veterinary, management of marine resources, soil science, land improvement, processing and preservation of agricultural products, as well as agricultural economy and sociology. Its research activity is conducted by 8 RPOs in Thessaloniki;
- The Regional Councils in the 13 regions of the country, which are endowed with (limited) funds for their development. In the context of their 13 independent RIS3 strategies, all available funding of Regional Councils will be spent in their respective priority areas to reinforce regional R&I. The contemplated new RTDI law is expected to upgrade even further their role.

In 2013 an Innovation Council was established but remained practically dormant. The government re-elected in 2015 committed itself to review its role in the context of the new RTDI strategy.

The country lacks an evaluation culture but is increasingly adopting evaluations at institutional and programme level. The most developed evaluation system is the one organised in compliance with the Structural Funds obligations of the country in the Secretariat for Public Investments (NSRF) of the Ministry of Economy, Development and Tourism. The impact assessments and real-time monitoring encompassing pre-agreed result and performance indicators include R&D&I among other relevant development goals.

Data collection and reviews are regularly undertaken by the National Documentation Centre (NDC). The review system provides descriptive statistics and output indicators and an overview of funding. There are ad hoc studies, which include occasionally evaluation elements of specific programmes launched by the GSRT, the Managing Authority of the Competitivenss OP and certain regions. These evaluations are not systematic and not retrievable in any central repository but their number is increasing over time. The Evaluation Plan submitted to DG Regio, which is mandatory for the current Programming Period (2014-2020) foresees a number of RTDI evaluations at national and regional level. They are not expected to start until 2017.

Conversely, institutional evaluations are developed, but performance is not directly linked to funding.

1. The Hellenic Quality Assurance and Accreditation Agency (HQA) undertakes evaluations for HEIs. The aim of the HQA is the development of a unified framework of Quality Assurance teaching and research in institutions of higher education at the national and international level, with a view to the national interest but also to the further development and continuous improvement of the European Higher Education Area (EHEA). In particular, the HQA has been given responsibility for the formulation, organization, completion, specialization and standardization of principles, criteria and indicators, as well as for the methodology and accreditation procedures in the above framework. The accreditation process consists of four phases:
    a. Phase 1 – Design and development of the Internal QA System of the Institution.
    b. Phase 2 – Self-evaluation of the Institution and of its QA System.
    c. Phase 3 – External evaluation of the Institution and of its QA System by a panel of independent external experts.
    d. Phase 4 – Issuance of the Accreditation decision by the Council of the HQA[36].

[36] http://www.adip.gr/en/insteval-procedures.php

2. GSRT supervised PROs are periodically evaluated by panels composed of international peers (in theory every five years; in practice this usually takes a little longer). Feedback reports are used by the PRO and the GSRT for policy and organisational purposes but do not affect funding.

Economic modelling is used internally by the Research centre KEPE and the Bank of Greece but there is no explicit reference to R&I. The modelling is not part of a public debate, and model details are not public.

1.2.3 Research performers

At the end of 2015, the Higher Education sector was composed of 22 public universities and 14 public Technological Education Institutes (TEI)[37]. In addition to public there are 28 private universities of various types accredited by the Ministry of Education, Research and Religion operating in the country[38]. Half the universities of the country are multi-disciplinary; two are focusing on technology, one on agriculture, one on fine arts and three on economics and business studies. There is one "open university" which serves teaching needs for the whole country and an international university targeting mainly students from the Balkans and Mediterranean countries. Universities are traditionally focusing on teaching and research; the third mission is only gradually penetrating their activities often with considerable resistance from the side of students and faculty.

There are 15 public research organisations, of varying sizes[39], supervised by the GSRT. Their performance differs significantly ranging from multi-disciplinary research organisations recognised for their excellence internationally to small introverted research centres. Sectoral ministries supervise their own PROs (network of agricultural research centres, defence etc.).

There is no systematic evidence of the composition of business research activities. There are a few large Greek companies which invest in technology-driven R&I in the ICT, food and pharmaceutical sectors. Based on EU2014 Industrial R&D Investment Scoreboard, PHARMATHEN (Pharmaceuticals & Biotechnology) and INTRALOT (Technology Hardware & Equipment) were the only Greek companies that featured among the top 1,000 EU companies on R&D spending and the top 2,000 world companies. The Bank of Greece was added in the 2015 Scoreboard, where three Greek companies feature among the top 2500. Kreta Farm (Food Producer) was among the top 1000 EU but did not make it to the world's top 250040. A large number of SMEs and start-ups are also declaring R&I activities mainly in service and incremental innovations. Very few multinational are research actors in the country.

[37] https://el.wikipedia.org/wiki/%CE%91%CE%BD%CF%8E%CF%84%CE%B1%CF%84%CE%B1_%CE%B5%CE%BA%CF%80%CE%B1%CE%B9%CE%B4%CE%B5%CF%85%CF%84%CE%B9%CE%BA%CE%AC_%CE%B9%CE%B4%CF%81%CF%8D%CE%BC%CE%B1%CF%84%CE%B1_%CF%83%CF%84%CE%B7%CE%BD_%CE%95%CE%BB%CE%BB%CE%AC%CE%B4%CE%B

[38] http://hca.gr/συχνές-ερωτήσεις/επιλογή-κολλεγίου-συμβουλές-προς-υπο/, December 2014

[39] L.4310/2014 (Art. 13a)

[40] http://iri.jrc.ec.europa.eu/scoreboard15.html

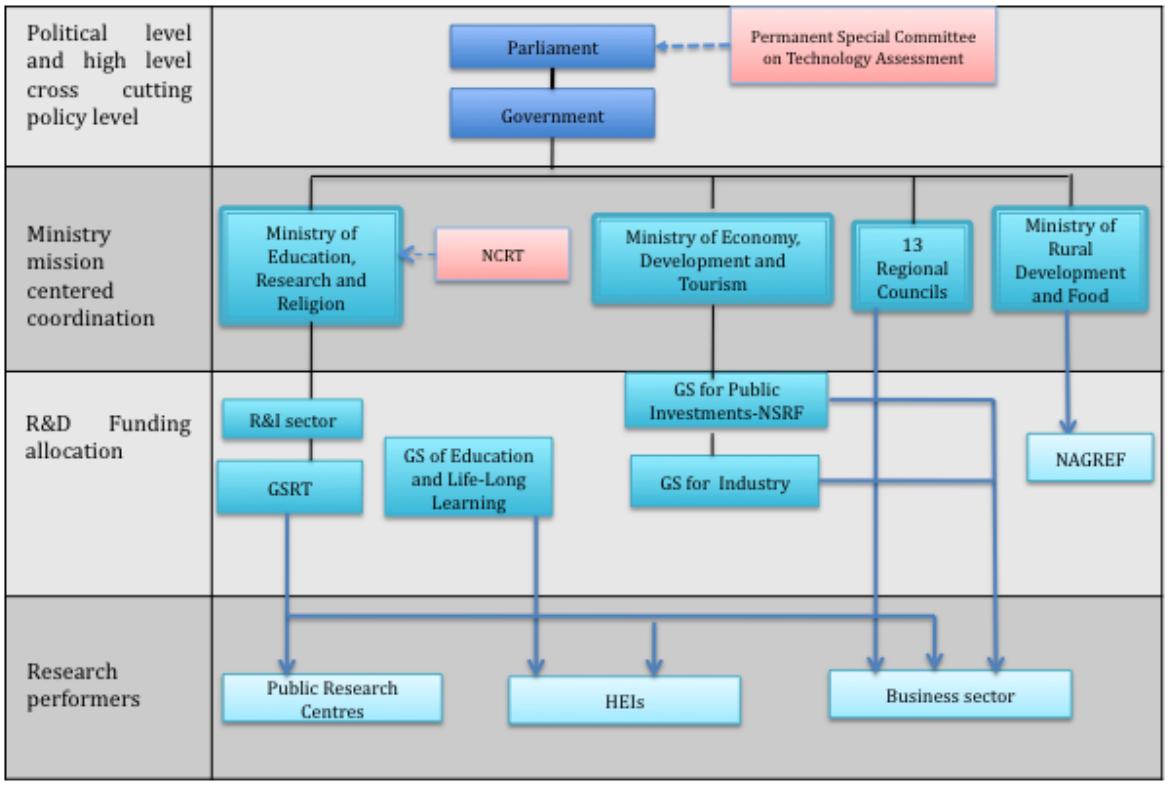

Figure 1 R&I governance system.

Source: National Strategy of Research and Innovation for Smart Specialisation 2014-2020, pg. 21 and own amendments

2. Recent Developments in R&I Policy and systems

2.1 National R&I strategy

Traditionally there is a national strategy for development and competitiveness and a national strategy for R&I, both financed almost exclusively by Structural Funds (SF). Complaints always existed that the main and sectoral strategies suffer from lack of coordination and that implementation is influenced by the need of absorbing regional development funds rather than maximising impact. The R&I policy is planned for a period of seven years following the cycle of the European Structural Funds.

In the current period an ambition for detailed strategies was proclaimed. However, the announcement of an Action Plan for the implementation of ESETAK 2015-2021, September 2014, has been delayed due to the political and economic uncertainty. ESETAK was originally planned to be the national R&I strategy, while the National R&I Strategy for Smart Specialisation 2014-2020 (RIS3) would be the part supported by the Structural Funds. RIS3 was approved by the Greek Parliament in August 2015 (Official Journal 1862/B/27.8.2015). The strategy presents an overview of the RTDI system in Greece, identifies strengths, weaknesses, opportunities and threats (SWOT analysis) and sets the thematic priorities for the programming period 2014-2020. As ESETAK is delayed at the moment, RIS3 is currently the only strategy document (see also section 2.4).

RIS3 includes efforts for cross-border cooperation and the GSRT has been active in pilot joint-programming actions in the past and is expected to continue in the future.

2.2 R&I policy initiatives

Policies in the last three years have suffered from the political changes and the end of the 2007-2013 policy cycles. The political changes created a need for potential revisions to comply with the agenda of the new government; the end of the cycle was determining the low spending during 2014-2015, as the new calls had not started yet.

Regarding important R&I policy initiatives (laws, regulations, support measures) that occurred in the last three years, the following should be noted:

- Law 4223/2013 introduced tax incentives on R&D expenses; the law allowed a 30% increase of R&D expenses and their deduction from the gross corporate income of the same fiscal year. In the event that R&D expenses refer to the purchase of equipment, they can be increased by 30% but they have to be distributed during a 3-year period;
- In December 2013, Law 4224/2013 foresaw a Greek Innovation Fund for financing SMEs and infrastructure projects in Greece. The Onassis Foundation and several Investment banks and governments from abroad announced their support and willingness to contribute. The fund is not operational yet.
- In April 2014, the Hellenic Federation of Enterprises (HFE) launched "Innovation Expert-Innovation in Action", a new initiative aiming to support innovation in Greek enterprises through networking and lectures (described in detail under Chapter 5.2);
- In May 2014, INNOVATHENS (a joint venture of the City of Athens and the Institute of Economic and Industrial Research) was established, aiming to create an innovation network in Athens (described in detail under Chapter 5.2);
- In October 2014, GSRT and the Hellenic Federation of Enterprises (HFE) signed a strategic partnership agreement for research, technology development and innovation (described in detail under Chapter 5.2);
- In December 2014, GSRT released the National Roadmap of Research Infrastructures (described in detail under Chapter 4.2);
- The National R&I Strategy for Smart Specialisation 2014-2020 was released in May 2015 (described in detail under Chapter 2.4) and signed by the Minister of the Economy in August 2015.

- The Alternate Minister established in March 2015 an R&I Sector at the Ministry of Education, Research and Religion and spearheaded the revision of the recently passed RTDI Law (L.4310/2014).[41]
- The redefinition of basic research, excellence and evaluation;
- The acknowledgement of the National Council for Research Technology Development and Innovation (NCRTDI) as the advisory body for the formation of national R&I strategy. Measures are taken for its establishment in a non bureaucratic and transparent way and its operation through two separate Committees. This body will replace NCRT;
- The fast absorption of funding from Structural Funds;
- The establishment and management of RPOs;
- The appointment of BoD members of RPOs;
- The improvement of the working environment of researchers and the amelioration of working conditions of postgraduate researchers;
- The revision of the composition and role of Regional Innovation Councils;
- The assessment of scientists with postgraduate studies for promotion to researchers by the same standards applied to researchers. This essentially means that even people from the market (scientists with post-graduate studies) will be able to join University faculty.

Public consultation for this draft law concluded in June 2015 and was expected to go to Parliament in the last quarter of 2015 but was then postponed to 2016

A draft Ministerial Decision was prepared by the R&I Sector for the simplification of procedures in the management, execution and monitoring of RTDI projects funded by grants and Structural Funds[42], but it has not yet been signed.

The appointment of an Alternate Minister for R&D for the first time was accompanied by his declaration that public action in all relevant policy areas will be designed and implemented in a strategic, coherent and integrated framework and tailored to foster innovation and strengthen the knowledge base and fundamental research. In practice, this has yet to materialise. However, in 2015 announced laws, interventions and policy measures have been postponed and there is no evidence of swift action. This is partly due to the need to comply with the ex-ante conditionalities of the ESIF, of which one (Thematic Objective 1) is still pending. ESIF is practically the only RTDI funding source at the moment.

Evaluations, consultations, foresight exercises

There have been no foresight exercises in the country except the one for the 21st century in 2001 – 2005). Evaluations in the context of the Structural Funds are used for the new programming period but are not going in-depth into R&I. An evaluation of the major R&I programmes of the previous programming period was launched and after several delays, it was expected to be submitted to the GSRT at the end of October 2015. Although it was presented in an open event in December 2015, the final report is still not public.

An encouraging development for evidence-based policy is the systematic monitoring and publications of data on R&I, which was missing in the past. NDC is conducting surveys and publishing regularly its results; among them a report "7 years of Excellence in the European Research Area 2007-2013", which depicts the performance of Greece in all ERC Grants launched by FP7 in the period 2007-2013[43].

[41] R&I sector, Summarised Review, March 2015-August 2015, Ministry of Culture, Education and Religion, pg. 2
[42] Ibid., pg. 5
[43] Pascual C., Sachini E. (2015), "7 years of Excellence in the European Research Area 2007-2013: the case of Greece", National Documentation Centre

In summary:

- ✓ 36 ERC grants were awarded to Greece in the period 2007-2013 (22 to ERC Starting grantees[44] and 14 to ERC Advanced grantees);
- ✓ All host organisations were public organisations (HEIs, research organisations). The Foundation for Research & Technology Hellas (FORTH), the National Technical University of Athens (NTUA), the Biomedical Sciences Research Centre Alexander Fleming and the National Centre for Scientific Research "Demokritos" hosted 56% of the Greek ERC grantees and received 64% of ERC funding (€35.4m);
- ✓ Proposals were submitted in the domains of Physical Sciences (63.8%) and Life Sciences (33.3%) with only one proposal submitted in Social Sciences and Humanities;
- ✓ Most of the grants were awarded to Attica and Crete (more than 80% of total).

Greek success rates were at about 5% and 3% in the Advanced and Starting Grants out of a total of 1,031 submitted proposals respectively, with an average Greek ERC success rate of 3.5%, about three times lower than the overall success rate (10.4%) and one of the lowest among ERA countries. However, success rates for Advanced and Starting Grants increase to 11 % and 4% for Advanced and Starting Grants respectively, if the first Starting Grant call is not taken into consideration due to oversubscription.

A new Community Innovation Survey for the period 2010-2012 was released in 2015. The sample included 15,000 Greek companies with over 10-12 employees. Greece ranked in 11th position with 52.3% of companies exhibiting some kind of innovation, compared to an EU-28 average of 48.9%. Organisation and marketing were the most common innovative activities for 45.4% of the companies. Technological innovation was exhibited by 34.3% of the respondents. Crete, Sterea Ellada, Attica and Central Macedonia outperform the market in terms of total number of innovative companies. Total investment for innovative activities reached € 1.2 b in Greece in the period 2010-2012 and more than 63% of the expenses is related to the acquisition of software, hardware and other kind of infrastructure and about 25% is related to internal R&D activities[45].

A study was concluded for assessing the efficiency of the Employment and Career Structures (DASTA) within HEIs. These are horizontal structures within HEIs that cater for the operation of Liaison Offices, the Innovation and Entrepreneurship Units and the Offices for Practical Training. The study was conducted through structured questionnaires distributed to students, graduates and professors of 12 HEIs in 8 regions of Greece[46]. The main findings of the study for HEI students and graduates were the following[47]:

- The IT systems of DASTA operated efficiently in only 4 out of the 12 HEIs. The remaining systems lacked technical and operational efficiency;
- 85% of the students and 12.2% of the graduates found useful the advisory support they received from DASTA;
- 79.7% of the students and 42.5% of the graduates found useful the lectures on innovation and entrepreneurship offered by DASTA;
- 43,5% of the students were very interested in the employment and career structure of their HEI;

[44] Addressed to early stage researchers

[45] Innovation in Greek companies 2010-2012, National Documentation Centre, 2015

[46] Attica (Panteion University, Athens University of Economics and Business, University of Piraeus, TEI Athens), Central Macedonia (Aristoteleio University of Thessaloniki, University of Macedonia), Eastern Macedonia-Thrace (Democritus University of Thrace), Peloponnese (university of Peloponnese), South Aegean (Aegean University), Thessaly (University of Thessaly), Western Greece (TEI Western Greece), Ipeiros (University of Ioannina)

[47] Study for the evaluation of the operation of Employment and Career Structure in Greek HEIs,: Second Deliverable: Final Study-Evaluation Study, TREK Consulting, pg. 135

- 68% of the students wanted the operation of the structure to continue while 32% also believed there was scope for improvement;
- 45.1% of the students and 43.2% of the graduates found DASTA useful for the expansion of their knowledge in collaborations with businesses and employers;
- 25.9% of the students and 28.9% of the graduates found DASTA useful for the expansion of their knowledge in the design of innovative business plans; and
- 26.1% of the students and 25.6% of the graduates considered DASTA very useful for the establishment of virtual innovation companies.

2.3 European Semester 2014 and 2015

The Greek National Reform Programme, April 2015 presents specific RDI initiatives in four distinct areas:

- The preparation of a new National Strategic Plan for R&I (ESPEK);
- The enhancement of Human Resources in Science and Technology (HRST);
- The strengthening of the national research system and the promotion of the optimal use of resources; and
- The mobilisation of the private sector for undertaking RDI initiatives.
- In preparation of ESPEK, cooperation was enforced between different Ministries for the inclusion of RIS3 in the new national R&I strategy. In parallel, the Operational Programme for Competitiveness, Entrepreneurship Research and Innovation includes measures for the promotion of RDI investments. A new simplified administrative system must be devised for better allocation of ESIF funds, with simpler management structures and coordination with other Operational Programs with RDI dimensions[48].

For the enhancement of HRST, a number of calls is implemented, with emphasis on young researchers ("Supporting enterprises for recruiting research personnel", "Financing research proposals which were positively evaluated in the 5th Call of ERC Grants Schemes", "ARISTEIA (Excellence) I", "ARISTEIA II" (see Section 3.4.3),"Financing research proposals which were positively evaluated in the 4th Call of ERC Grants Schemes", "Supporting post-doctoral researchers-(POSTDOCs)", "Supporting enterprises for recruiting high level scientific personnel") [49].

For strengthening the national research system and promoting the optimal use of resources the initiative "Proposals for the Development of the Research Centres KRHPIS" is implemented. Moreover, a call for the participation of Greek researchers in the European ESFRI infrastructures was launched by GSRT, and the National Roadmap for large research infrastructures was published (see section 4.2 below). In addition, a restructuring of the research system is envisaged which is expected to lead to synergies and economies of scale[50]. Measures are also examined to increase the demand for innovation services by Ministries or Regional Authorities.

The mobilisation of the private sector for undertaking RDI initiatives is the objective of some measures already implemented in 2014 and 2015 (Law 4110/2013, appointment of Alternate Minister for R&I, RDI law 4310/2014). Other measures that have been implemented include[51]:

- PAVET 2013 for the support of R&D actions in the thematic areas prioritised by RIS3;
- The gi-Cluster with emphasis on the production of competitive products in the areas of Gaming and Creative Content (gi-Cluster), The gi-Cluster includes 40 enterprises and 10 research and higher education institutes, with more than 20 new products under development and €10m investments on R&D;

[48] Greek National Reform Programme, April 2015, pg. 69
[49] Greek National Reform Programme, April 2015, pg. 69-70
[50] Greek National Reform Programme, April 2015, pg. 70
[51] Greek National Reform Programme, April 2015, pg. 71-72

- The si-Cluster for the production of competitive products in Space Technologies. It includes 13 innovative projects aiming to increase at national level sales by 47%, exports by 69%, private investments by 20%, R&D expenditure by 82% and patents by 68%[52];
- The Energy and Bio Cluster, also run by Corallia like the si- and gi-Cluster
- The support of enterprises for recruiting high level scientific and technical personnel for a maximum period of 3 years with a budget of € 9.5 m.

In the new programming period 2014-2020 initiatives will be undertaken for the increase of R&D investments of the private sector in sectors where the country has a comparative advantage, as identified by RIS3 (see section 2.4 below), the creation of new enterprises with a research orientation, the drafting of new financial instruments for RDI and the enforcement of links between universities/research institutions and the private sector[53].

The National Reform Programme (NRP) 2015 also foresees measures for increasing participation of researchers in HORIZON 2020 and the promotion of international outreach of Greek entities. Within this context, bilateral agreements, participation in Joint Technology Initiatives and in the construction of ESFRI research infrastructures is prioritized[54].

The Commission in its 2015 European Semester Analysis placed Greece among countries with a low level of research performed by the public R&I system and funded by business (0.3%), in concordance with its rather low BERD[55].

2.4 National and Regional Research and Innovation Strategies on Smart Specialisation

The Smart Specialisation strategy is currently essentially the National Strategy for R&I in the period 2015-2020. RIS3 was developed both at national and at regional level (13 regional plus 1 national smart specialisation strategies):

- At the national level, RIS3 places emphasis on eight sectors, namely the agro-food industry, culture - tourism-creative industries, health, pharmaceuticals and life sciences, energy production and services, transport services and logistics, environmental sciences, Information/Communication Technologies (ICT) T and materials-construction. As per the RIS methodology the Greek RIS3 intends to support these sectors with the aim of improving the viability, export potential, innovation and existing scientific specialisation of local human resources in research and development[56]. These sectors are further specified through the entrepreneurial discovery process, ie collaboration of businesses with academia and the identification of synergies[57];
- At the regional level each region specifies its own priorities. Most regions include the agro-food industry, tourism-culture life sciences, and building materials. Energy production and services, transport services and logistics, environmental sciences and IT are considered to be horizontal support sectors for the enhancement of entrepreneurship and innovation in the regions[58]. However, some regions identify horizontal priorities (e.g. ICT as an enabling technology and not a target per se in a few regions; the knowledge complex in general in Crete), whereas in other there are specific local strengths that are unique to the region (e.g. metal production in Central Greece).

[52] http://www.ekt.gr/content/display?ses_mode=rnd&ses_lang=el&prnbr=88050, December 2014
[53] Greek National Reform Programme, April 2015, pg. 71-72
[54] Greek National Reform Programme, April 2015, pg. 72-73
[55] European Commission, EUROPEAN SEMESTER THEMATIC FICHE RESEARCH AND INNOVATION
[56] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, pg. 102-104
[57] Action Plan for the implementation of ESETAK 2015-2021, September 2014, pg. 31-32
[58] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, pg. 105

RIS3 is based on 3 strategic priorities:

- the investment, creation and dissemination of new knowledge in the areas of research excellence, capacity building and enhancement of R&D collaborations;
- the reinforcement of R&I investment with the support of innovative companies and the development of new innovative companies;
- the development of an innovation culture and the enhancement of collaboration between RTDI and society.
- The Regional Smart Specialisation Strategies for 13 regions were prepared in 2013 by consultants in cooperation with the authorities taking into account a comprehensive analysis of the regional innovation landscape (SWOT analysis). The following priorities were identified by region:
- Attica: transport systems (maritime and urban), creative industries, knowledge intensive business services; (green) ICT as a key enabling technology for efficiency improvements in the private and public sectors, eco-innovation for the enhancement of urban environment[59];
- Central Macedonia: eco-innovation across manufacturing, agricultural and service (green ICT and tourism) sectors, and specific innovation actions to improve efficiency through e-government, public-private partnerships for service delivery[60];
- Eastern Macedonia and Thrace: stronger innovation policy integrating the ideas of smart specialisation, identification of niche markets both in domestic and export markets, manufacturing and the regeneration of the industrial tissue of the region, enhancement of the competitiveness of SMEs[61];
- Western Macedonia: adoption of a more diversified approach building on existing clusters of business activity and shifting from energy into higher-value added activities with a strong focus on exports[62];
- Crete: agro-food sector (production, packaging, food processing, Mediterranean diet), the cultural-tourist sector (hospitality, travel agencies, cultural capital, cultural activities), and the technological educational sector (research centres, universities, technology park) and its connection to the other two sectors, reduction of the dual economy, with a split between low technology agricultural and tourism activities and high technology research and education and a few spin-off firms[63];
- Ionian islands: bio-economy, both on natural resources and biodiversity (with a potential for reinvigorating the agricultural sector through the production of new crops and a focus on designated origin, etc. products) as well as aquatic resources (blue-biotech) [64];
- Epirus: RTDI investment on R&D for the dairy industry and other agro-food firms, ICT in regional health and tourism services and manufacturing production and, technology know-how related to environmental protection and sustainable exploitation of the natural biodiversity[65];

[59] RIS3 Assessment: Attica, A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus, (Reid A., Komninos N., Sanchez J., Tsanakas P., December 2012)
[60] RIS3 Assessment: Central Macedonia, A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus, (Reid A., Komninos N., Sanchez J., Tsanakas P., December 2012)
[61] RIS3 Assessment: East Macedonia and Thrace, A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus, (Reid A., Komninos N., Sanchez J., Tsanakas P., December 2012)
[62] RIS3 Assessment: Dytiki Makedonia, A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus, (Reid A., Komninos N., Sanchez J., Tsanakas P., December 2012)
[63] RIS3 Assessment: Crete, A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus, (Reid A., Komninos N., Sanchez J., Tsanakas P., December 2012)
[64] RIS3 Assessment: Ionian islands, A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus, (Reid A., Komninos N., Sanchez J., Tsanakas P., December 2012)
[65] RIS3 Assessment: Epirus, A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus, (Reid A., Komninos N., Sanchez J., Tsanakas P., December 2012)

- Peloponnese: cluster programmes for agro-food, tourism and manufacturing sectors and cross-sectoral support for technological upgrading of business sectors[66];
- North Aegean: bio-economy, branding based on natural environment[67];
- South Aegean: cross-sectoral technology upgrading and adaptation of production processes to reduce energy use, reduce material input and waste generated, higher value products and services related to tourism[68];
- Sterea Ellada: modernisation of the agro-food sector, promotion of environmental and energy saving technologies and ICT, cross-sectoral opportunities for applying other key enabling technologies, notably ICT[69];
- Thessalia: cross-sectoral opportunities for applying other key enabling technologies, notably ICT, strengthening the access of regional firms to knowledge intensive business services, focus on metal production and construction materials along with agro-food sector and related industries[70];
- Western Greece: bio-economy[71].

All 14 RIS3s are approved under the condition of specific provisions in individual Action Plans. The last one was the National Strategy which was formally published on 27/8/2015.

National RIS3 includes strategic priorities translated into policy initiatives and a detailed consideration of financial requirements required by each initiative. There are measures to stimulate private investment through the initiative for development of new financing instruments by the use of matching funds, crowd funding, micro-credit facility mechanisms, crowd sourcing, business angels, incubators, and patient funds[72]. Research Infrastructures (RI) are included in the national RIS3 through the initiative for the development and operation of a cloud based digital R&I platform in open access technology[73] and an initiative for the upgrading of existing RIs of HEIs and RPOs[74].

The main aspects for the Action Plan include the assurance that the Entrepreneurial Discovery process will be properly implemented and the overall monitoring and evaluation will be well organised. This process is expected to be concluded by the end of 2015[75].

Monitoring of RIS3 at national and regional level will be effected by GSRT through output and result indicators, field studies, and public consultation with the business and research community, and through evaluation studies of actions by independent experts[76].

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[66] RIS3 Assessment: Peloponnese, A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus, (Reid A., Komninos N., Sanchez J., Tsanakas P., December 2012)
[67] RIS3 Assessment: North Aegean, A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus, (Reid A., Komninos N., Sanchez J., Tsanakas P., December 2012)
[68] RIS3 Assessment: South Aegean, A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus, (Reid A., Komninos N., Sanchez J., Tsanakas P., December 2012)
[69] RIS3 Assessment: Central Greece, A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus, (Reid A., Komninos N., Sanchez J., Tsanakas P., December 2012)
[70] RIS3 Assessment: Thessaly, A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus, (Reid A., Komninos N., Sanchez J., Tsanakas P., December 2012)
[71] RIS3 Assessment: Western Greece, A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus, (Reid A., Komninos N., Sanchez J., Tsanakas P., December 2012)
[72] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions,, pg. 58-59
[73] Ibid., pg. 21-23
[74] Ibid., pg. 26-27
[75] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, pg. 151
[76] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, pg. 153

2.5 Main policy changes in the last five years

Main Changes in 2011
Adoption of Law 4009/2011 -Structure, operation, quality assurance of academic studies and internationalisation of HEIs introducing the Charter and Code and changes in the structure of HEIs
Main changes in 2012
Supervision of GSRT changed from the Ministry of Education, Research and Religion to the Ministry of Economy, Development and Tourism
Supervision of GSRT was transferred back to the Ministry of Education, Research and Religion
Main changes in 2013
The Ministry of Development, Competiveness, Infrastructure, Transport and Networks was split into two independent ministries, namely the Ministry of Development and Competitiveness and the Ministry of Infrastructure, Transport and Networks. The management of the NSRF remained with the new Ministry of Development and Competitiveness
Establishment of Innovation Council
Publication of R&D metrics
Plan Athena entered into force
Adoption of Law 4115/2013 introducing provisions for the professional development of researchers Adoption of Law 4223/2013 on tax incentives
Main Changes in 2014
New RTDI Law Launch of GSRT Evaluation study
Main Changes in 2015
Creation of the position of Alternate Minister for R&I Creation of a new R&I Sector at the Ministry of Education, Research and Religion Release of the new national Smart Specialisation strategy Law 4327/2015 extended the term of NCRT and specified the ESIF intermediaries for RTDI programmes Adoption of the Smart Specialisation Strategies at the national and regional levels.

3. Public and private funding of R&I and expenditure

3.1 Introduction

GBAORD has increased by almost 27% in the period 2011-2014 from €648.5m in 2011 to €823.1m in 2014, albeit with a small decrease (4.1%) in 2014. The highest increase was observed in 2013 (17.3%).

The government is the principal funder of R&D activity, covering 53.1% (€786.2m) of total GERD in 2014, compared to 52.3% in 2013 (€766.1m). HEIs and public research organisations received the bulk of this funding (92.9%), with Business Enterprise Sector (BES) only receiving € 52.9m (6.7%) and the private non-profit only €2.8m.

The BES is the second biggest contributor to GERD, providing €444.2m (30.3% of total), about the same as in 2013. More than 89% of this capital funds BERD (€397.8m). HEIs receive less €33m.

Funding from abroad covered 13.3% (€196.8m) of total GERD in 2014, compared to 14% in 2013 and 15.8% in 2011. The majority of the funds were channeled to HEIs and public RPOs (about 70%).

R&D funding in the programming period 2014-2020 is difficult to estimate because of the current austerity programme and GDP contraction that hamper national planning. The NRP 2015 set a target for R&D funded by BES to reach 0.38% of GDP by 2020[77].

Total GERD decreased by 3.8% in 2012, compared to 2011 but started to pick up later on mostly fuelled by the government and BES. GERD/GDP grew because of the decline of the denominator. GERD performed by private non-profit organisations also increased significantly in 2013 (42.6%), but its size is still low to make an impact (€18.5m at the end of 2014). R&D performed by HEIs and the business sector has been decreasing in the period 2011-2013 to the benefit of R&D performed by the government sector but the trend was reversed in 2014. The latter increased from 23.8% in 2011 (€331.7m) to 26.9% in 2013 (€397.91m). The initial decline can be explained by the crisis: in HEIs salaries were reduced (as they are part of GUF their reduction leads automatically to reduced R&D spending); the business sector on the other hand faced a significant credit shortage and it is likely that long term investments were reduced to cope with immediate needs.

Table 2 Basic indicators for R&D investments

Indicator	2011	2012	2013	2014	EU average (2014)
GERD (as % of GDP)	0.67	0.69	0.8	0.83	2.03
GERD (Euro per capita)	125.1	120.3	133.3	135.6	558.4
GBAORD (€m)	648.5	731.9	858.6	823.1	92,828.145 (Total for EU28)
R&D funded by BES (% of GDP)	0.22	0.21	0.24	0.25	1.12 (2013)
R&D funded by PNP (% of GDP)	0.01	0.01	0.01	0.01	0.03 (2013)
R&D funded by HES (% of GDP)	0.02	0.01	0.02	0.02	0.68 (2013)
R&D funded from abroad (% of GDP)	0.1	0.11	0.11	0.11	0.20 (2013)

[77] Greek National Reform Programme, April 2015, pg. 80

Indicator	2011	2012	2013	2014	EU average (2014)
R&D performed by HEIs (% of GERD)	40.2	39.9	37.4	38.3	0.47
R&D performed by government sector (% of GERD)	23.8	24.8	28.0	27.1	0.25
R&D performed by business sector (% of GERD)	34.9	34.3	33.3	34.4	1.30

3.2 Smart fiscal consolidation

3.2.1 Economic growth, fiscal context[78] and public R&D

Greece is the EU MS that was hit the most by the 2008-09 economic crisis decreasing its real GDP every year since 2008 and losing in total ca. 26% of it until 2013. The economy began to grow again in 2014 (0.7%), as private consumption strengthened and net exports (tourism and shipping) grew[79]. Investment increased in the third quarter of 2014 for the first time since 2008. The Commission expects 0% growth in 2015 and a small drop in 2016 (0.7%) due to slight weakenings of domestic demand. However, according to the Commission, timely implementation of the structural reforms would gradually strengthen economic fundamentals and aggregate demand and would enable a 2.7% real GDP growth in 2017.

With a government budget deficit of almost 11% of GDP and a public debt reaching 113% of GDP, Greece had a very bad fiscal position already at the outburst of the crisis (Figure 2). Protracted high deficits (9%-15% of GDP) in subsequent years mounted up the public debt to 178.6% of the GDP by 2014. After the one-off impact of the 2012-13 bank recapitalisations, 2014 was the first year when the government succeeded to reduce the headline deficit close to the 3% of GDP Treaty reference value (3.6%), and the second year in a row of a structural balance surplus (2013: 2.3%, 2014: 1.3%). Although the fiscal policy measures agreed with the Greek authorities as part of the adjustment program are expected to generate savings (up to 2% of GDP throughout 2015-2017) and a primary deficit net of bank recapitalisation costs of close to the agreed target (0.25% of GDP) in 2015, one-off costs of bank recapitalisation will worsen the balance resulting in a headline deficit of 7.6% in 2015. According to the Commission forecast the headline deficit would be around 3.4% and 2.1% of GDP in 2016-17 if primary surplus targets of the financial assistance program (2016: 0.5%, 2017: 1.75%) are met, the fiscal adjustment continues and the economic environment improves. Still, the public debt ratio is expected to peak in 2016 at 185% and to decline to around 182% in 2017.

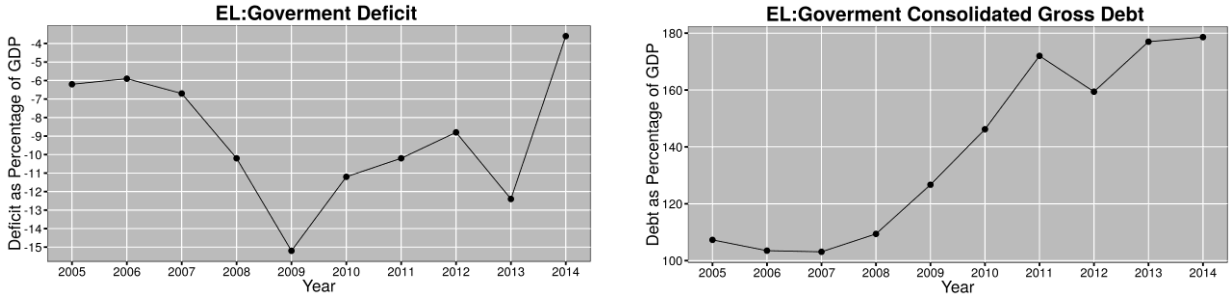

Figure 2 Government deficit and public debt. Data source: Eurostat

[78] Sources: DG ECFIN, 2015 Winter Forecast (http://ec.europa.eu/economy_finance/eu/forecasts/2015_winter/el_en.pdf), 2012 Spring Forecast (http://ec.europa.eu/economy_finance/eu/forecasts/2012_spring/el_en.pdf), RIO

[79] Although this growth is to some extent a statistical artefact from prices dropping more than nominal GDP.

Total GERD in Greece was €1,489m in 2014. There are three main sources of R&D funding: the business sector (€444m), the government (€793m), and foreign funding (€197m). Direct funding from the government goes to R&D in business enterprises (€53m), the government (€339m) and the higher education sector (€399m).

Table 3 Key Greek R&D Indicators

	2007	2009	2013
GBAORD, % of gov. exp.	0.59	0.67	0.82
GERD, % of GDP	0.58	0.63	0.80
out of which GERD to public, % of GDP	0.40	n.a.	0.52
Funding from GOV to, % of GDP			
Business	0.01	n.a.	0.02
Public (GOV+HES)	n.a.	n.a.	0.40
Total	n.a.	0.34	0.42
EU funding, % of GDP	n.a.	n.a.	0.09

Source: Eurostat

3.2.2 Direct funding of R&D activities

The sources of R&D funding according to the Frascati manual are: Government sector (GOV), Higher education sector (HES), Business enterprise sector (BES), Private non-profit sector (PNP) and Abroad (including EC). In this analysis the public sector as source of funds is given by the GOV part of the total intramural R&D expenditure (GERD), whereas the public sector as a sector of performance is the aggregation of GOV and HES. Gaps in the reporting of the data as well as insufficient level of detail in the reported indicators (e.g. sporadic data on the sub-categories of "Abroad") do not always allow for conclusion. Figure 3 below shows the historical evolution of GERD financing in current prices in Greece.

The total R&D expenditures (GERD) were reduced by more than 15% between 2008 and 2010 as a consequence of the economic crisis and the cuts in the funding from the government. The following years the total GERD fluctuated around the same low levels and despite the increase in 2014 it hasn't reached the pre-crises levels yet.

Contrary to the publicly funded GERD, the contribution from the private sector was increasing until 2009 whereas the drop in 2011 and 2012 was less dramatic.

Greece has not systematically reported data on the funds for R&D from the EC. Data are available only for 2005 and 2011 and they indicate a slightly negative trend.

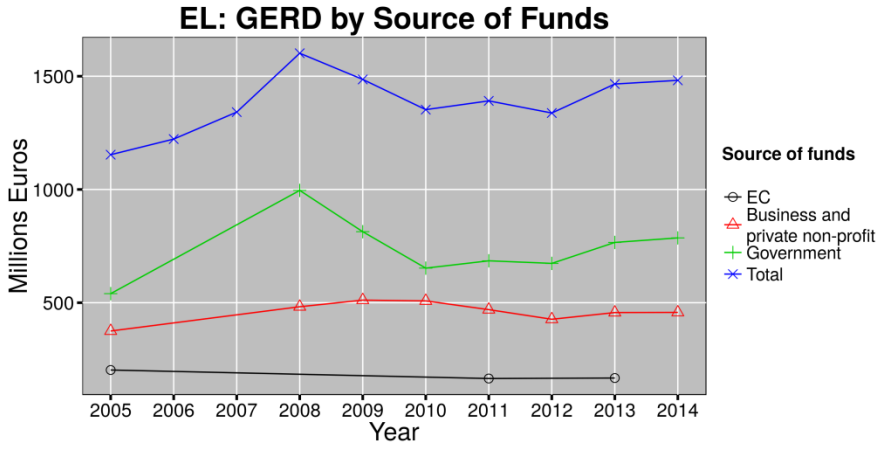

Figure 3 Funding of the total GERD. Data source: Eurostat

3.2.2.1 Direct public funding from the government

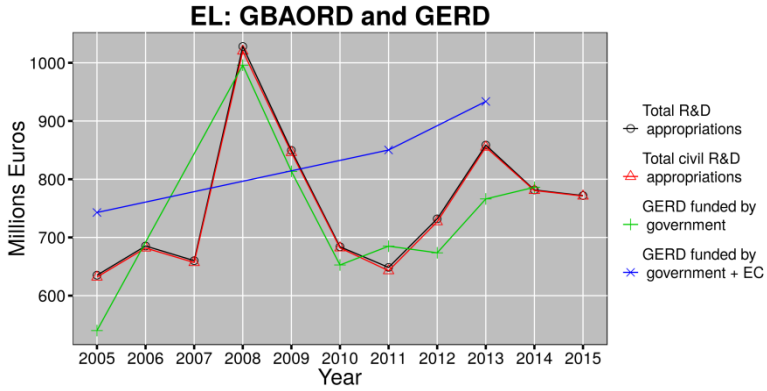

Figure 4 R&D appropriations and government funded GERD in millions of national currency. Data source: Eurostat

The total and civil R&D appropriations practically coincide demonstrating the marginal role of the budget for military R&D in Greece. The total appropriations and the GERD funded by the government are also very close following more or less the same fluctuations. It is important to note the lack of data on the GERD funded by the government for the period 2006-2007 as well as the lack of data on funding from EC, as Structural Funds contributions are not differentiated from government funding. Structural Funds are the single most important source of competitive funding, with national Greek spending almost exclusively dedicated to institutional funding (mainly salaries). Nevertheless, the Structural Funds for the period 2007-2013 dedicated to 'Core' R&D activities represent only 2.3% of the total SF for Greece, i.e. far below the corresponding share at EU28 level (9.4%).

Regardless of the units applied (current prices or % GDP), both GBAORD and GERD funded by the government peak in 2008 and drop rapidly in 2009 and 2010, as a result of the general cuts attributed to the Greek economic and financial crisis. Although GBAORD increased by about 10% (in nominal terms) in the period 2011-2013, in 2014 it is still only slightly superior to the levels of 2006. Due to the gap in the time series of the government funded GERD, it can only be stated that the levels of 2014 are about 30% less than the peak of 2008.

When the total R&D appropriations and the GERD funded by the government are expressed as percentage of GDP, there is a considerable increase in the years 2012-2013 which is due to the GDP decline in those years and the simultaneous increase in the publically financed R&D.

The Europe 2020 R&D target set by Greece in the context of the 2013 National Reform Programme of 0.67% of GDP has already been achieved, and the Greek authorities have expressed in the 2014 National Reform Programme their intention to attain a level of 1.21% of GDP by 2020.[80] It should be mentioned, however, that Greece's original EU2020 R&D target was 2%, which was revised downwards to 0.67% only in 2013 in the face of austerity and continuing recession.

[80] COMMISSION STAFF WORKING DOCUMENT: Assessment of the 2014 national reform programme for GREECE

3.2.2.2 Direct public funding from abroad

Table 4 Public Funding from Abroad to Greek R&D (in millions Euros)

Source from abroad	2005	2008	2009	2010	2011	2012	2013	2014
Total	219.021	91.9	129.4	160.3	205.229	210.9	204.93	196.8
BES	8.1	n.a.	n.a.	n.a.	30.631	n.a.	28.41	n.a.
EC	202.8	n.a.	n.a.	n.a.	165.255	n.a.	167.44	n.a.
GOV	0.51	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
HES	0.825	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
International Organizations	0.9	n.a.	n.a.	n.a.	3.268	n.a.	0.83	n.a.
Total as % GERD	18.99	5.74	8.71	11.85	14.75	15.77	13.98	13.28
EC as % GOVERD	37.55	n.a.	n.a.	n.a.	24.13	n.a.	21.86	n.a.

Table 4 shows that R&D funding from "Abroad" dropped dramatically between 2005 and 2008. Due to the break in the time series (data for 2006 and 2007 do not exist) it is not possible to determine whether it was a gradual decrease over the years or a sudden fall related to the crisis.

On the other hand, EC contributions (excluding Structural Funds, which are not counted under funding from abroad) represent a smaller share of the total external funding in 2011 compared to 2005. Again due to the lack of systematically reported data it is not possible to provide explanations and meaningful conclusions with regard to this behaviour. However, it can be seen that from 2009 to 2012 there has been a continuous increase in the importance of the R&D funding from abroad in relative terms i.e.as percentage of the total R&D expenditure.

According to the data on allocations of Structural Funds from DG REGIO the total Funds for Greece for the period 2007-2013 amounted to 20.2 billion Euros of which 0.5 billion, i.e. 2.3%, was dedicated to 'Core' R&D activities[81]. This percentage is below the corresponding share at EU28 level (9.4%).

Distribution of public funding

Figure 5 below shows how R&D funding from the government is distributed among the public and the business sectors. Once again, the missing data from 2006 to 2010 make it hard to detect and interpret any trends. It can be seen however, that the public sector takes the lion's share of the funding from the government. Moreover in 2013 there is a moderate increase in the overall funding from the government, which is more pronounced when expressed as percentage of GDP. Given that funding from "Abroad" is reduced compared to 2012, it is possible that the observed increase is due to the actual effort of the Greek government to compensate for this decrease.

[81] The definition of 'Core' R&D activities, is provided in the study "Cohesion policy and regional research and innovation potential

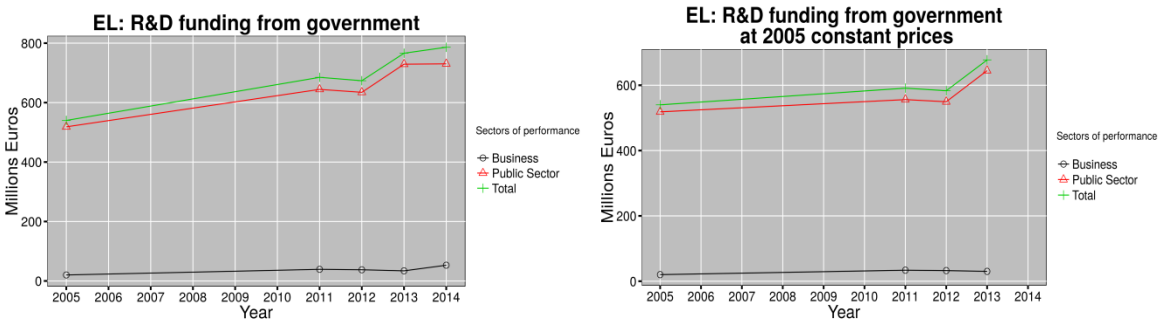

Figure 5 Government intramural expenditure by sectors of performance. Data source: Eurostat

3.2.3 Indirect funding – tax incentives and foregone tax revenues

Indirect funding was until recently practically inexistent. The new tax Law 4223/2013 from 2013 allows deduction of R&D expenses from taxable company income of up to 30% during the period in which the expenses are realized. It provides for their allocation in a 3-year period, in an effort to stimulate R&D investment during the financial crisis.

Fiscal incentives furthermore include tax allowances for 10 years for newly established companies or 8 years for all other companies for employing R&D personnel in innovative projects. The maximum level of the contribution depends on the region in which the specific project takes place and the size of the company implementing it. It can reach up to 50% for very small companies in less developed regions (North and South Aegean islands, Ipeiros, Western Greece, Eastern Macedonia and Thrace).

According to a study on R&D tax incentives for DG TAXUD, "Greece is on the generous end of tax incentives towards R&D with up to 130% enhanced allowances and also tax free reserves for exporting income resulting from R&D investments that lead to internationally recognised patents." However, "the Greek scheme results in a very large degree of heterogeneity of the tax support that translates into higher administrative and compliance costs for firms and overall makes the R&D tax incentives non-transparent"[82]. In particular, there is a general lack of information about how the different incentive schemes interact towards creating a maximum allowance of public support. Since many companies in Greece are currently recording no or low profits, the impact of the measure may be rather limited.

3.2.4 Fiscal consolidation and R&D

As shown in 3.2.1, post-crisis fiscal consolidation in Greece is still ongoing. Figure 6 below shows the scatterplot of the structural balance and GBAORD as % GDP (first panel) as well as GERD as % GDP (second panel)[83].

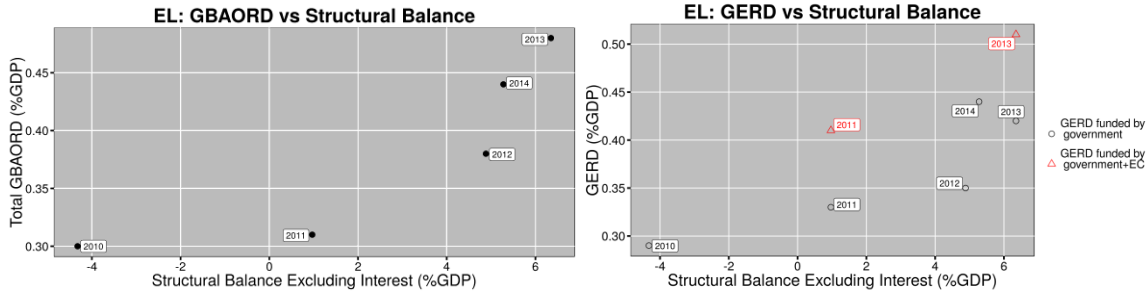

Figure 6 Fiscal consolidation and R&D. Data source: AMECO, Eurostat, OECD

[82] DG TAXUD, A Study on R&D Tax Incentives, August 2014

[83] Structural balance data comes from the AMECO database the other indicators were taken from Eurostat and OECD.

Based on Figure 6, while the structural deficit shrank and turned into a surplus during 2010-2014, both GBAORD and government financed GERD increased nominally as well as in % of GDP (see Figure 4). Nevertheless, it is hard to argue that the 2010-2014 fiscal adjustments did not have a negative impact on direct public support to R&D, given the accompanying decline in GDP and the drastic absolute drop in government-funded GERD between 2008 and 2010. Adding indirect funding through R&D tax incentives might improve the picture given that "Greece is on the generous end of tax incentives towards R&D"[84] (section 3.2.3). However, the quality of this data is not sufficient in order to be taken it into account in the analysis. The fact that government-funded GERD in 2014 was higher than in 2007 before the crisis might still signify a degree of political commitment to supporting R&I. Moreover, whereas there are no empirical studies on the impact of R&D tax incentives in Greece so far, it is doubtful that their effect could have been large, given that many Greek firms have not made profits, and thus paid little in taxes overall, since the beginning of the crisis. Based on the right panel of Figure 6, EU funding was very important for the public funding of the Greek R&I system during 2010-14, as it constituted almost the only source of competitive funding. The strong reliance on Structural Funds and their statistical accounting as government spending partially explains why public funding for R&I has not declined further after 2010 despite continuing austerity.

3.3 Funding flows

3.3.1 Research funders

The responsibility of funding research is divided between the Ministry of Education, Research and Religion (GSRT and Secretariat of Education and Life-Long Learning) and the Ministry of Economy, Development and Tourism (Secretariats for Public Investments and of Industry), of which the former has the overall responsibility for supporting regional development in general including entrepreneurship and partly (recently) innovation. The Ministry of Economy, Development and Tourism is managing Structural Funds. Funds coming from the Regional Operational Programmes are typically under the responsibility of the Regional Councils. The Ministry of Rural Development and Food supervises the NAGREF, which undertakes research and technology in Greece in agricultural, forest, animal and fish production, the protection of crops, veterinary management of marine resources, soil science, land improvement, processing and preservation of agricultural products as well as agricultural economy and sociology through the operation of 8 RPOs (see Chapter 1.2.2 and Figure 1).

The mechanism for fund allocation is based on the initial programming documents of the PA and the Operational Programmes, which describe the specific measures at the beginning of each programming period. Institutional funding is based on the general provisions of budget allocation, now respecting the constraints of the austerity programmes.

Private not-for-profit funding of public research performers is minimal.

3.3.2 Funding sources and funding flows

There is no detailed historical information available for the share of different public funding sources but the shares are fairly stable over the years. The national public budget, co-funded by the Structural Funds, has been and continues to be the main funding source. Due to the announcement of 100% support from Structural Funds in 2015, they are now the major funder of GERD. Absorption is satisfactory and there are no funds lost at the end of the respective programming periods; however, calls are usually slow to start and speed up towards the end of the n+2 period. Total funding from FP6 and FP7 reached € 1.5 b, about 2.6% of all EU contribution to the Member-States.

[84] DG TAXUD, A Study on R&D Tax Incentives, August 2014

FP7 funding (€ 1 b) was more than twice the FP6 funding (€456.8 m)[85]. Funds from abroad are approximately 15% of GERD. R&D expenditure is expected to increase to € 2.6b (1.2% of GDP) by 2020, with more than 58% of funding being provided by structural funds and the public budget[86]. It is estimated that public funding from the national public budget (national competitive funds and regular budget) will increase from € 450 m in 2014 to € 1.2 b in 2020. EU Structural Funds will increase from €320m in 2014 to €400 m in 2020[87].

In the period 2014-2020, Greece plans to allocate the second lowest percentage (5.9%) of SF funding to RTDI investments (€900.2m) among the 28 Member States. Most of these funds (24.2%) will be channeled to "Research and innovation activities in public research centres and centres of competence including networking (code 060)", followed by "Technology transfer and university-enterprise cooperation primarily benefiting SMEs (code 062)" and" Research and innovation processes in large enterprises (code 002)", which account in total for more than 61% of total available SF for RTDI[88].

3.4 Public funding for public R&I

3.4.1 Project vs. institutional allocation of public funding [89]

Institutional funding was and remains block funding. There has been no legislative reform for the allocation of R&D project and institutional funds.

According to Eurostat, project based funding has been steadily increasing and accounted for 50.4% of total funding from GBAORD in 2014 (against 49.9% in 2013 and 31.4% in 2012). Institutional funding accounted for 49.6% of total GBAORD funding in 2014 (against 50.1% in 2013 and 68.6% in 2012)[90]. The steady decrease of institutional funding is attributed to the austerity policy of the last four years. Project funding is co-funded by the Structural Funds, hence is not so much affected by the crisis and supported R&D activities.

3.4.2 Institutional funding

Institutional funding is not based on an institutional assessment[91]. While both HEIs and PROs are subject to evaluations, the evaluation results are not linked to the budget allocation. An effort to link incremental funding to excellence in the '90s was abandoned very soon.

The largest part of institutional funding is channelled to universities and research centres in the form of block funds, which are largely path dependent. At the moment block funding is constantly decreasing, hence any effort to introduce performance-based criteria might lead low-performing research centres to close down. In this spirit the idea of closing down certain peripheral HEIs (in the context of enforcement of the ATHENA plan for the reduction of HEIs) may be the only indication of assessment-based funding.

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[85] Data provided by JRC

[86] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, pg. 132

[87] Greek National Reform Programme, April 2015, pg. 80

[88] JRC RIO calculations based on the DG REGIO data

[89] Institutional funding is defined as the total of national budgets in a given country, attributed to an institution, with no direct selection of R&D project or programmes and for which money the organisation has more or less freedom to define the research activities to be performed" Institutional funding can be in the form of non-competitively allocated Block funding. Institutional funding may also be allocated in a variable/competitive manner tied to institutional assessments. Project funding is defined as the total of national budgets in a given country, attributed to a group or an individual to perform an R&D activity limited in scope, budget and time, normally on the basis of the submission of a project proposal describing the research activities to be done (Steen, J. v. (2012), "Modes of Public Funding of Research and Development: Towards Internationally Comparable Indicators", OECD Science, Technology and Industry Working Papers, 2012/04, OECD Publishing. http://dx.doi.org/10.1787/5k98ssns1gzs-en).

[90] Eurostat, Total GBAORD by funding mode (gba_fundmod)

[91] European Research Area, Progress Report 2014, pg. 104

3.4.3 Project funding

The main channel for competitive funding is the Operational Programme (OP) for Competitiveness and the Regional OPs, both co-financed by the Structural Funds. Almost all non-block funding is distributed via calls for proposals, most of them launched by the Ministry of Education, Research and Religion through the GSRT (for applied research and innovation). All these calls are competitive and evaluated by experts (national and international). Peer review principles are used in all calls for project funding and efforts are made to maximise the number of non-national evaluators involved[92]. Evaluators are scientists selected either from an official registry or from the "Web of Science"[93].

There is an effort to increase international peer review, introduced by law 3653/2008, for project selection. Law 3777/2009 introduced provisions similar to processes followed by the European Commission, such as the decision on final ranking of proposals and selection decisions to be taken by committees and not individual peers. This process has already been implemented in many calls. International panels (composed of foreign researchers and Diaspora Greeks) evaluated "Clusters", "Innovation Poles", "Cooperation" and "Excellence". Smaller traditional programmes like PAVET (industrial research support) are evaluated by peers and committees composed of Greek scientists. Research funding organisations must apply core principles for international peer review including excellence, impartiality, transparency, appropriateness, in order to maximise efficiency and speed of project selection[94]. Application success rates vary.

Key Research programmes in operation are[95]:

Heraclitus II (2010-2015) for the support of doctorate scholarships (€ 39.6 m) with the aim of increasing the labour force of researchers

- Thales (2009-2015) for the support of research teams in Greek universities through the funding of interdisciplinary and inter-institutional research projects (€ 120 m)
- Archimedes III (2009-2015) for the support of research initiatives in Technical Education Institutions (TEI) (budget € 21 m), post-doctorate research (€ 30 m) and research projects implemented by a primary investigator (€60 m); and
- ARISTEIA II for the support of excellent scientific networks in Greece of young scientists (€ 61 m).

The national RIS3 includes initiatives to stimulate research and innovation in the public sector that will materialise into programmes once the new OP for Competitiveness and Entrepreneurship becomes operational. The most important of these initiatives are the following:

- Establishment of competence centres for the support of long term research needs. Such centres may be developed by the Regions, HEIs, RPOs, businesses, Science and Technology Parks (STPs) and incubators with SMEs being the key beneficiaries. Total budget is at € 169m and will be provided by ERDF, European, Maritime and Fisheries Fund (EMFF) and the European Agricultural Fund for Rural Development (EAFRD)[96];

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[92] European Research Area, Progress Report 2014, pg. 23

[93] Analysis of the ERA state-of-play in Member States and Associated Countries: focus on priority areas, Country Report, Greece, (Konstantina Tsiki,, May 2013)

[94] Law 4009/2011, this criterion is also mentioned in the Work Programmes issued by the Greek Government

[95] http://erawatch.jrc.ec.europa.eu/erawatch/opencms/search/advance-search.html?action=search&query=&matchesPerPage=5&displayPages=10&index=Erawatch%20Online%20EN&sort=&searchPage=1&tab=template&subtab=&orden=LastUpdate&reverse=true&searchType=advanced&country=gr&avan_other_prios=false&intergov=all&avan_type=support#listado, December 2014

[96] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 8-9

- Provision of subsidies to RPOs monitored by GSRT, for conducting research in thematic priority areas identified by RIS3. Funding per project could range between €500,000 and € 6m. Total budget is at € 40m and will be provided by ERDF[97].
- Support of research of HEIs through subsidies. Funding per project could range between € 500,000 and € 6m. Total budget is at € 72m and will be provided by ERDF[98].
- Support of RPOs and HEIs in the exploitation of their research results. Funding will be provided in two stages; in the first stage, funding will cover market analysis, feasibility studies and technology assessment studies. In the second stage, funding will cover business plans, the development of prototypes, promotional activities, industrial design expenditures and IPRs. Funding could take the form of subsidies/innovation coupons. Total budget is at € 59.5m and will be provided by ERDF[99].
- Programme for the funding of spin offs. Funding could take the form of subsidies/innovation coupons. Maximum funding per project could range between € 30,000-€200,000. Total budget is at € 100m and will be provided by ERDF[100].

3.4.4 Other allocation mechanisms

In June 2015, the Confederation of Greek Industries launched the initiative "Innovation Expert-Innovation in Action" funded by the Education and Life Long Learning Operational Programme. The initiative aims to enhance innovation within business through the provision of executive training, advisory services and networking. It is expected that 460 executives from 230 companies will benefit from the programme. The curriculum will encompass 23 training programmes[101].

In addition a large number of events and mentoring activities are promoted by chambers, associations and NGOs recognising that the best road to development is the revival/renewal of the business sector. In July 2015, the Small Enterprises' Institute of the Hellenic Confederation of Professionals, Craftsmen and Merchants and the Institute of Commerce and Services of the Hellenic Confederation of Commerce and Entrepreneurship invited SMEs established in Athens to express their interest in receiving advisory services on innovation at business. The support would be provided free of charge for a period of 4 months and up to 80 companies established in Athens[102].

3.5 Public funding for private R&I

3.5.1 Direct funding for private R&I

The main public programs to stimulate research and innovation in the private sector (in the process of termination in 2015) are the programmes:

- Collaboration (2009-2015) for the support of collaborative research by private companies and public research organisations (about €230 m);

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[97] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 19-20

[98] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions,, pg. 20-21

[99] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions,, pg. 38-39

[100] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 38-39

[101] http://sev4enterprise.org.gr/%CF%80%CE%BB%CE%B7%CF%81%CE%BF%CF%86%CE%BF%CF%81%CE%AF%CE%B5%CF%82-%CE%B3%CE%B9%CE%B1-%CF%84%CE%B7%CE%BD-%CF%80%CF%81%CF%89%CF%84%CE%BF%CE%B2%CE%BF%CF%85%CE%BB%CE%AF%CE%B1-%CE%BA%CE%B1%CE%B9%CE%BD

[102] http://www.ekt.gr/content/display?ses_mode=rnd&ses_lang=el&prnbr=90683

- Support for R&D in groups of small and medium-sized enterprises (SMEs) (2009-2015) for the financing of research projects implemented by groups of SMEs, public research organisations, technology transfer organisations and technology suppliers (€ 10.7 m);
- Support for R&D in new firms (2009-2015) for the financing of small to medium research projects targeting project and process innovations (€ 10.8 m);
- New Innovative Entrepreneurship (2011-2015) for the provision of grants in manufacturing sectors (€30 m);
- Creation (2009-2015) for the support of new innovative enterprises, notably highly knowledge intensive (spin off and spin out) (€44 m); and
- PAVET 2013 for the support of R&D activities of dynamic enterprises that will lead to added-value products and services (€29 m).

As there has been no formal evaluation the coherence and impact of these programmes has not been assessed. All programmes follow a standard peer review selection process (many of them international). Time to contract is notoriously long.

National RIS3 includes initiatives to stimulate research and innovation in the private sector that will materialise into programmes once the 2014-2020 OP for Competitiveness and Entrepreneurship becomes operation. The most important of these initiatives are the following:

- Establishment of competence centres for the support of long-term research needs. Such centres may be developed by the Regions, HEIs, RPOs, businesses, STPs and incubators with SMEs being the key beneficiaries. Total budget is at € 169m and will be provided by ERDF, European, Maritime and Fisheries Fund (EMFF) and the European Agricultural Fund for Rural Development (EAFRD)[103];
- Support of existing SMEs in the introduction of new products/services or new production methods. Beneficiaries will be new and existing SMEs. Funds can be in the form of subsidies or innovation coupons. Total budget is at € 125m, funded by ERDF[104];
- Support of restructuring and technological development of SMEs. Beneficiaries will be new and existing SMEs. Funds can be in the form of subsidies or innovation coupons. Total budget is at € 150m, funded by ERDF[105];
- Development of new financing instruments through matching funds, crowd funding, micro-credit facility mechanisms, crowd sourcing, business angels, incubators, patient funds, for the support of start-ups and other businesses. Total budget equals € 100m and will be funded by ERDF[106];
- Funding of spin offs with a budget of € 100m provided by ERDF[107];
- Provision of support and incubation services to start ups, seed companies, new scientists and researchers for a 3-year period that could be extended following an evaluation. Budget is set at € 345 m and will be provided by ESF, the Initiative for Youth Employment (also funded by ESF) and the EAFRD[108];

[103] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 8-9
[104] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 51
[105] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 52-53
[106] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 58-59
[107] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 38-39
[108] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 34-36

- Establishment and development of innovative start-ups for a period of 1-4 years. Budget is set at € 540 m and will be provided by ESF, the Initiative for Youth Employment (also funded by ESF) and EAFRD[109];
- Support of innovative cluster projects through collaborations between academia and businesses with total budget of € 300 m, funded by ERDF and EAFRD[110];
- Grant scheme to businesses for the financing of RTDI projects with a total budget of €318m funded by ERDF and ESF[111]; and
- Programme for the support of RTDI collaborations between RPOs, HEIs and businesses for the production of innovative products and processes. Total budget is at € 255m and will be provided by ERDF, EMFF and the EAFRD[112].
- Pure innovation support measures include:
- The national Innovation Voucher Scheme: From September 2009 up till 2012, 286 projects had been approved. In these projects research components are also included. The Scheme will run also in the current programming period;
- Support to innovative companies through matching private venture capital funds. Four Funds are financed by JEREMIE;
- The Openfund established in 2008 by 7 investors with an initial capital of €500.000 to provide pre-seed and seed financing to technology companies. Investment tickets were €20.000-€50.000 for a 15% equity stake. The fund raised supplementary financing of €10m (Openfund II), principally from the European Investment Fund and 11 private investors. By April 2014, the Fund had invested in 7 companies (€2.5m) but will have invested the totality of its funds by the end of 2015[113]. A call was launched in May 2014 for the provision of pre-seed and seed funding (€50.000-€100.000)[114].
- The Odyssey JEREMIE Partners Fund is focused on ICT investments and has the support of Eurobank. By April 2014, Odyssey JEREMIE Partners had invested a total of €4.6m in 4 companies. Odyssey JEREMIE Partners also funds the incubator Metavallon[115];
- PJ Tech Catalyst Fund supported by Piraeus Bank provides seed financing to ICT companies and has a total capital of €15m. By April 2014, the Fund had invested €2m in 7 companies and one start-up incubator (Iqbility) and was ready to finance another 3 companies[116];

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[109] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 37

[110] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 41-43

[111] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 43-48

[112] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 16-17

[113] http://fotiskollias.wordpress.com/2014/04/14/jeremie-funds-%CE%B5%CF%80%CE%B5%CE%BD%CE%B4%CF%8D%CF%83%CE%B5%CE%B9%CF%82-%CE%BC%CE%B5-%CF%84%CE%BF-%CF%83%CF%84%CE%B1%CE%B3%CE%BF%CE%BD%CF%8C%CE%BC%CE%B5%CF%84%CF%81%CE%BF-%CF%80%CE%BF%CF%85/, December 2014

[114] http://www.startupgreece.gov.gr/content/jeremie-openfund-ii-spring-2014-call-proposals-0, December 2014

[115] http://fotiskollias.wordpress.com/2014/04/14/jeremie-funds-%CE%B5%CF%80%CE%B5%CE%BD%CE%B4%CF%8D%CF%83%CE%B5%CE%B9%CF%82-%CE%BC%CE%B5-%CF%84%CE%BF-%CF%83%CF%84%CE%B1%CE%B3%CE%BF%CE%BD%CF%8C%CE%BC%CE%B5%CF%84%CF%81%CE%BF-%CF%80%CE%BF%CF%85/, December 2014

[116] http://fotiskollias.wordpress.com/2014/04/14/jeremie-funds-%CE%B5%CF%80%CE%B5%CE%BD%CE%B4%CF%8D%CF%83%CE%B5%CE%B9%CF%82-%CE%BC%CE%B5-%CF%84%CE%BF-%CF%83%CF%84%CE%B1%CE%B3%CE%BF%CE%BD%CF%8C%CE%BC%CE%B5%CF%84%CF%81%CE%BF-%CF%80%CE%BF%CF%85/, December 2014

- Elikonos Jeremie Sicar has a total capital of €17m and investments in 4 companies (€4m) [117]. Investment focus is on clean technology and ICT.

In addition in July 2013 a MOU was signed between the Ministry of Economy, Development and Tourism and the German bank KfW for the creation of new Investment Fund (Institution for Growth) by the end of 2013 which will finance regional development mostly of SMEs and promote development and innovation. In December 2013, the Greek Parliament voted on the law for the establishment of this Fund. Onassis Foundation has also agreed to contribute €30m to the Fund. Institution for Growth (IfG) established the first of the three sub funds in May 2014 in Luxemburg with €100 m contribution from Greece and €100 m contribution from KfW[118]. However, the funds have not started operating yet.

A Common Ministerial Decision is being prepared for the simplification of all procedures related to R&I grants co-funded by the Structural Funds, speeding up the different phases of implementation and improving effective monitoring. In addition the adoption of a State Aid Guideline is expected to facilitate decision making[119]. These simplification procedures are not yet implemented.

Funding schemes are not regularly evaluated and benchmarked against comparable schemes in other countries.

3.5.2 Public procurement of innovative solutions

The total value of R&D public procurement contracts in Greece was about €21,5m in 2011, 61% more than in 2010 (€13.3m)[120]. A survey among Greek companies found that in the period 2010-2012, 81.8% of public procurement contracts (from Greek public bodies) did not involve carrying out any innovative activity in this context. 6.2% of companies had contracts that listed innovation as a prerequisite, and 11.9% of companies carried out innovative activities in the context of public procurement contracts without this being a prerequisite[121].

Greece transposed the two 2004 Directives on public procurement (2004/17/EC and 2004/18/EC) into national law in 2007 with the Presidential Decree 59/2007 regarding the procurement of supplies and services and the award of public works contracts in the field of water, energy, transport and post utilities, and the Presidential Decree 60/2007 regarding the coordination of contractual procedures in the field of public contracts regarding public projects, supplies and services. Directives 2014/24/EU and 2014/25/EU are currently being transposed into Greek law. Law 4310/2014 on RTDI recognises pre-commercial public procurement as a means to support R&I, as does the 2015 draft for the revision of this law.

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[117] http://fotiskollias.wordpress.com/2014/04/14/jeremie-funds-%CE%B5%CF%80%CE%B5%CE%BD%CE%B4%CF%8D%CF%83%CE%B5%CE%B9%CF%82-%CE%BC%CE%B5-%CF%84%CE%BF-%CF%83%CF%84%CE%B1%CE%B3%CE%BF%CE%BD%CF%8C%CE%BC%CE%B5%CF%84%CF%81%CE%BF-%CF%80%CE%BF%CF%85/, December 2014

[118] https://www.kfw.de/KfW-Group/Newsroom/Aktuelles/Pressemitteilungen/Pressemitteilungen-Details_203840.html, December 2014

[119] http://www.gsrt.gr/News/Files/New1068/Fylladio%20Apologismou%20Tomea%20Erevnas%20kai%20Kainotomias.pdf

[120] European Commission, DG CONNECT, 2014, "Quantifying public procurement of R&D of ICT solutions in Europe". Forthcoming.

[121] National Documentation Centre, 2015, Innovation in Greek companies 2010-2012, pg. 37

PPI/PCP landscape in Greece

There are no dedicated national measures for public procurement for innovation in Greece. Demand-side support to innovative ICT companies was an unintended side effect of past e-government procurement initiatives[122]. The national smart specialisation strategy, adopted in mid-2015, includes an initiative for the enhancement of PPI with a total planned budget of €40m, funded from ERDF (pre-commercial procurement processes for the development of pilot applications in education, museums, alternative tourism, and lighthouse projects)[123]. In general however, low administrative capacity and experience with PCP/PPI in combination with austerity budgets will continue to be a severe constraint for public procurement for innovation in Greece[124].

Greek procurers are participating in the buyers group of the EU-funded PCP project PREFORMA on long term digital preservation (Greek Film Center) and in the networking project COMPLETE (Greek Research and Technology Network GRNET) that prepares the ground for PPI on novel optical networking solutions[125].

3.5.3 Indirect financial support for private R&I

R&D capital expenditures are tax-deductible expenses from the gross income of businesses deducted equally in 3 years starting from the year in which they take place. L.4223/2013 provides for tax exemptions of R&D expenditure allowing for up to 30% deduction of R&D expenses. Subsidies and grants are provided for the employment of personnel devoted to a particular innovative programme (L. 3908/2011) based on the age and/or size of the company, number of employees, innovative nature of business etc.[126]. Fiscal incentives include tax allowances for 10 years for newly established companies or 8 years for all other companies and grants for lease payments for the acquisition of new infrastructure for a maximum period of 7 years. The maximum level of the contribution depends on the area in which the specific programme takes place and the size of the company implementing it. It can reach up to 50% for very small companies in less developed regions (North and South Aegean islands, Ipeiros, Western Greece, Eastern Macedonia and Thrace etc.).

3.6 Business R&D

3.6.1 The development in business R&D intensity

In 2014, Greece had the fourth-lowest BERD intensity among the EU-28. As Figure 7 shows, BERD intensity was higher in 2011 than before the economic crisis in 2007, and has followed an upward trend since. However, this is to a very large extent due to the contraction of GDP, which in 2014 had lost around 25% compared to the pre-crisis (2008) level.

Per-sector BERD data is only available for 2011 and 2013. Based on these two data points, the service sector has a larger R&D intensity than manufacturing, with both having modestly increased over the two years.

[122] Tsipouri and Athanassopoulou, 2013, Public Procurement for Innovation in Greece. In "Public procurement, Innovation and Policy: International perspectives", ed. Kalvet et al., Springer.
[123] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 62-63
[124] Lianou, 2015, Innovation Procurement situation/experiences in Greece. Presentation at EC workshop on legal framework for innovation procurement, Brussels, 4 December 2015.
[125] http://ec.europa.eu/digital-agenda/news/innovation-procurement-initiatives-around-europe
[126] EVCA Tax Benchmark Study 2012, June 2013

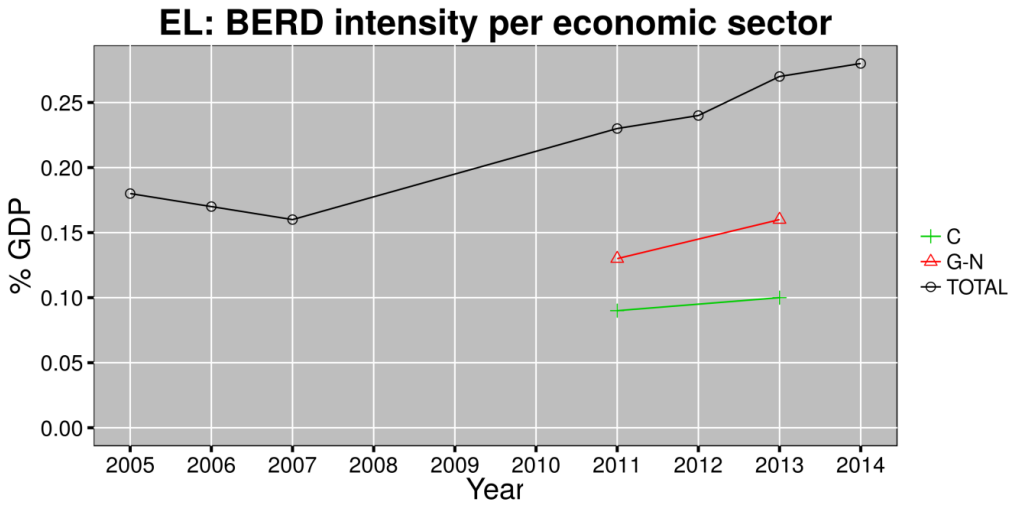

Figure 7 BERD intensity broken down by most important macro sectors (C= manufacture, G_N=services).

The private sector has been the largest contributor to Greek BERD for the whole period under study (with the caveat that there is no data available for 2008-2010). Its contribution as a percentage of GDP has somewhat increased in the past few years, also in absolute amounts (from €485m in 2011 to €504m in 2014).

Funding of BERD from Abroad is rather marginal, having stagnated at 0.03% since 2011 (which represents a slight increase in absolute terms). Government funding is even lower at 0.02% since 2011, with a slight increase last year.

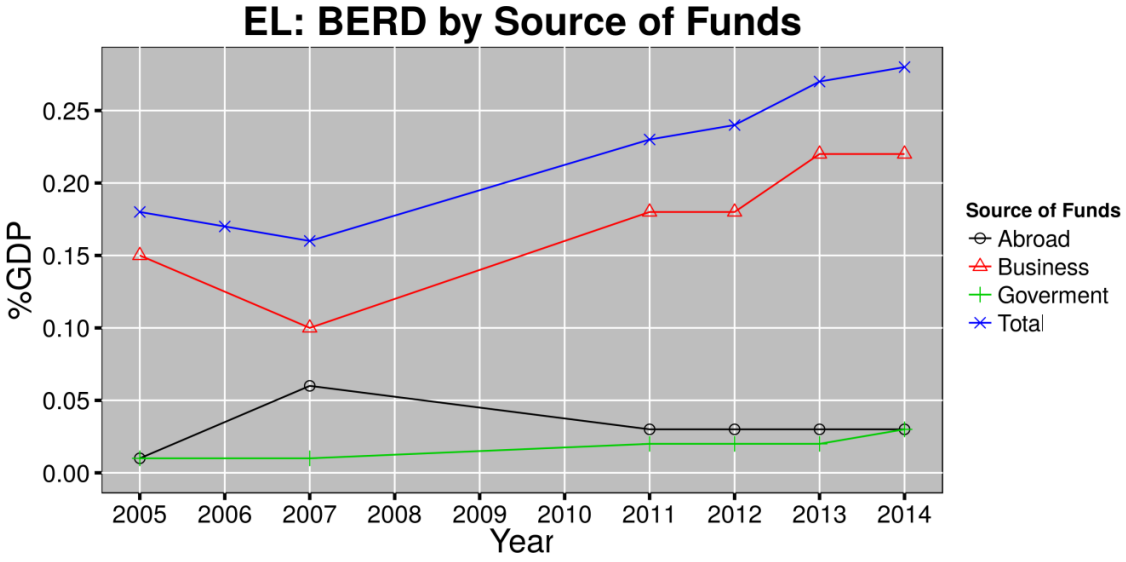

Figure 8 BERD by source of funds

3.6.2 The development in business R&D intensity by sector

In 2013, Greece ranked 23rd in the EU in terms of R&D expenditure as a percentage of GDP, both in the manufacturing (0.1%) and the services sector (0.16%).

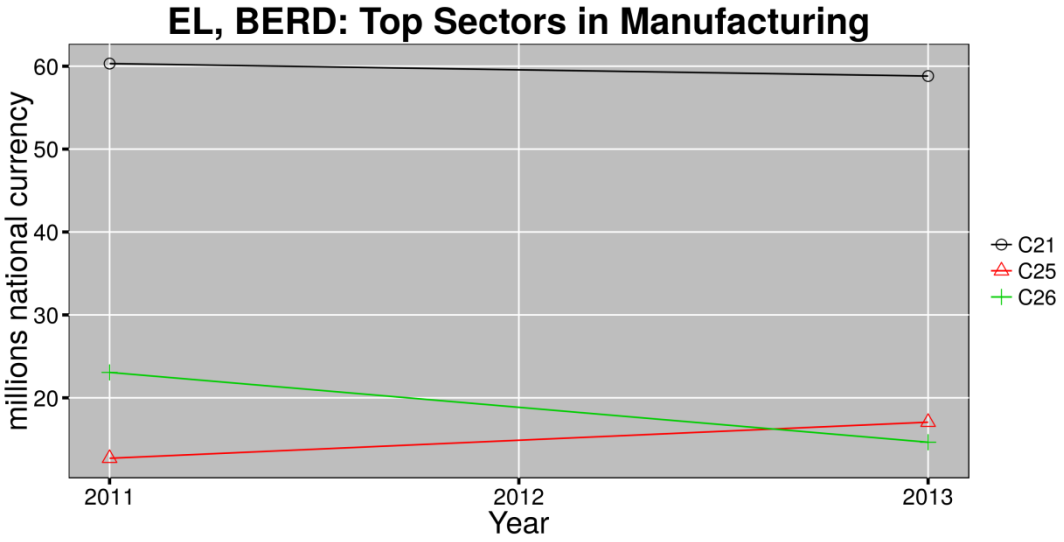

Figure 9 Top sectors in manufacturing (C26=manufacture of computer, electronic and optical products; C21=Manufacture of basic pharmaceutical products and pharmaceutical preparations; C25=Manufacture of fabricated metal products, except machinery and equipment).

Data on sector-level R&D expenditure in Greece is available only for 2011 and 2013, making description and interpretation of trends difficult. In 2013, the pharma sector was by far the largest R&D investor in the manufacturing sector. Further top spending sectors – tailing pharma by a great distance – were manufacture of fabricated metal products as well as manufacture of computer, electronic and optical products. This is reflected by the sectors of activity of the only Greek companies among the EU top 1000 R&D investors: Pharmathen (pharmaceuticals) and Intralot (technology hardware). Whereas R&D expenditure in the pharma sector stayed almost the same between 2011 and 2013, human resources in science and technology in medium-high and high tech manufacturing dropped by 24%.

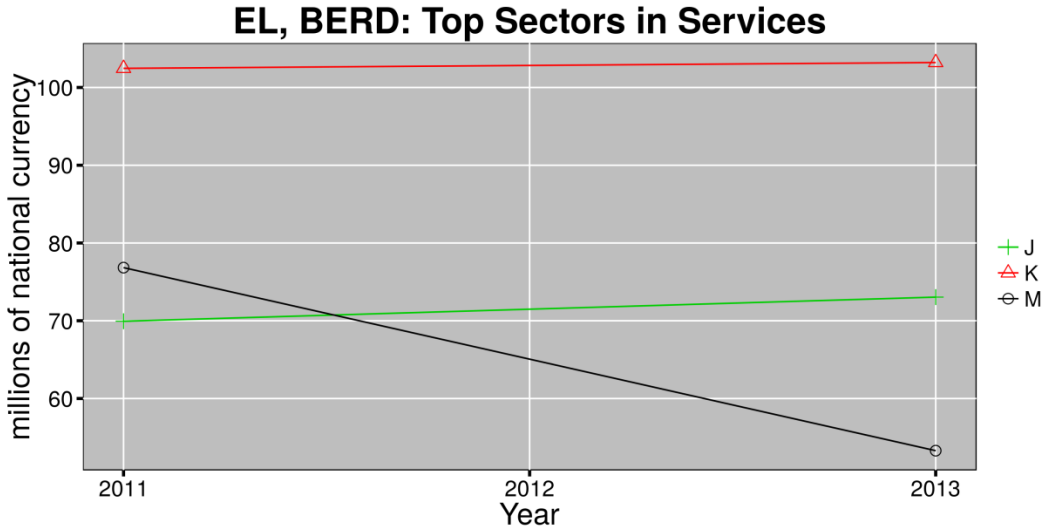

Figure 10 Top service sectors (J=information and communication, M=professional, scientific and technical activities, K=Financial and insurance activities).

Financial and insurance activities were the leading R&D spending sector within services and overall. Information and communication, and professional, scientific and technical activities were also important R&D spenders, with the latter losing 50% of its R&D investments in 2013. The R&D expenditures in services seem to be spread across a larger number of enterprises than in manufacturing, since in the R&D Investment Scoreboards of both 2011 and 2013 list only manufacturing companies among Greece's largest single R&D investors.

While financial and insurance activities spent a similar amount on R&D in 2013 and 2011, human resources in science and technology in this sector fell by 5%. The R&D expenditure drop in professional, scientific and technical activities was accompanied by a 7% reduction of S&T human resources in this sector.

3.6.3 The development in business R&D intensity and value added

R&D expenditure is not reflected in sectors' share of Gross Value Added in the Greek economy (Figure 11). Two services sectors (real estate and wholesale/retail trade) generate the highest share of total GVA, the former one well above the EU average. They are, however, not among the leading service sectors in R&D expenditure.

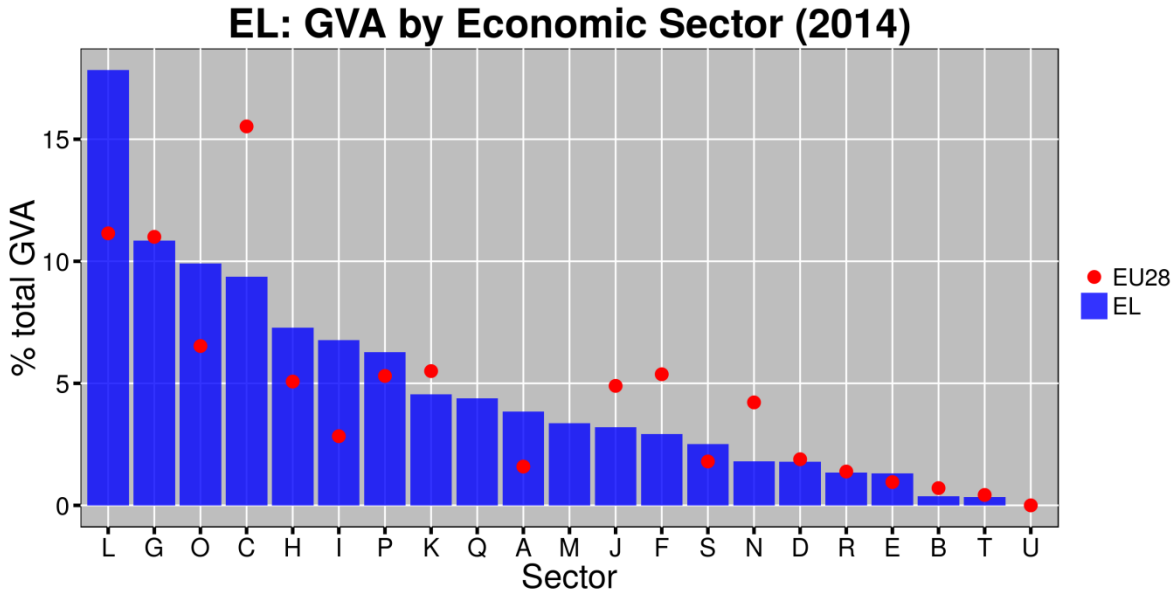

Figure 11 economic sectors as percentage of the total GVA. Top 6 sectors in decreasing order: 1) Real estate activities; 2) Wholesale and retail trade; repair of motor vehicles and motorcycles; 3) Public administration and defence; compulsory social security; 4) Manufacturing; 5) Transportation and storage; 6) Accommodation and food service activities.

Within manufacturing, the pharmaceutical sector's lead in R&D expenditure is not matched by the distribution of GVA share across sectors: food production generates by far the largest share of total GVA (well above the EU average).

Figure 12 GVA in manufacturing. Top 6 manufacturing sectors: 1) Manufacture of food products; beverages and tobacco products; 2) Manufacture of coke and refined petroleum products; 3) Manufacture of basic metals; 4) Repair and installation of machinery and equipment; 5) Manufacture of fabricated metal products, except machinery and equipment; 6) Manufacture of other non-metallic mineral products.

Analysing sectors' value added at factor cost in nominal terms (Figure 13) confirms the overall impression that only in the services sector GVA follows to some extent the pattern of sectoral R&D expenditure. Financial and insurance services score high on this indicator throughout the whole period under study, whereas value added of all three manufacturing sectors leading in R&D is persistently low.

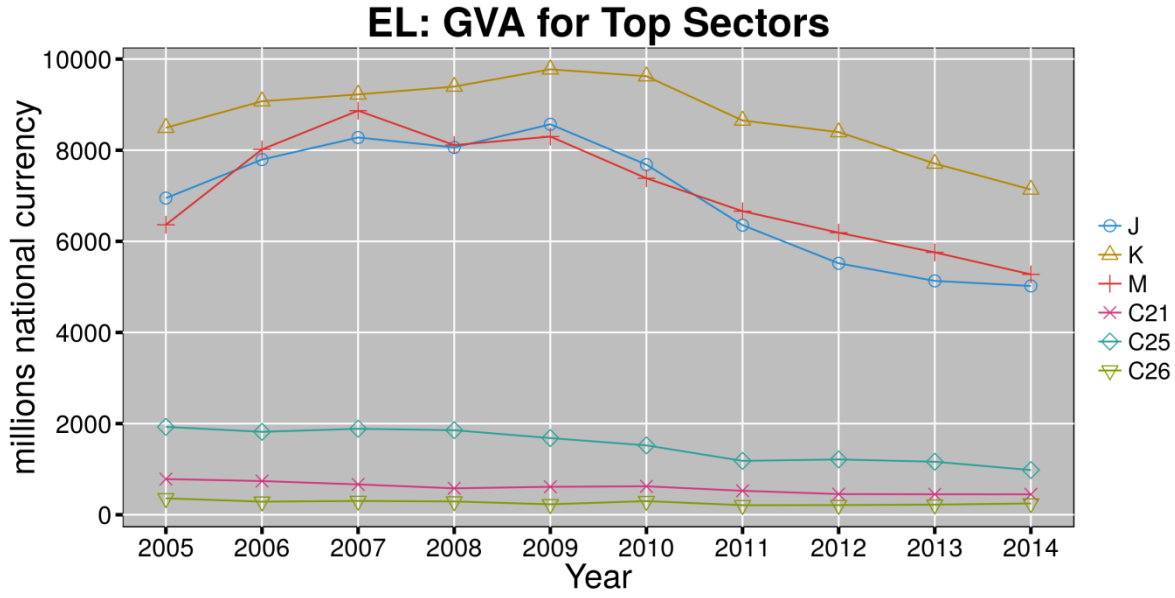

Figure 13 value added for the leading manufacture and service sectors in Figures 9 and 10.

3.7 Assessment

Institutional funding in Greece is exclusively block funding. There has been hefty opposition to evaluations and accreditations discouraging efforts to link assessments to institutional funding. As salaries are fixed based on formal criteria (rank and seniority) and investments and operational budgets are distributed with equal growth (or reduction) rates on the previous year's budgets, there has been traditionally little room for rewarding merit and excellence. To make up for this centralised approach to block funding a large share of funding is attributed via competitive calls. There is, however, some evidence that the issue of performance-based support may be more in the core of discussions in the future, in particular because of the limitation of resources. The first signs include peripheral HEIs closing down. A system that will allow for more competitive institutional funding needs to be devised to create incentives for excellence and ensure longer term planning in excellent institutions.

Efforts should be made for higher quality and higher ambitions in the use of structural funds. Absorption speed of Structural Funds (ERDF, ESF, CF) need to increase. The Memorandum of Understanding on Specific Economic Policy Conditionality devotes a whole chapter of actions to achieve this objective, including elimination of "sleeping" approved contracts, estimation of overbooking and restriction to approve new projects unless these actions are concluded. Provisions for facilitations of funding and promoting excellence are expected to be included in the new RDI law that will be enforced in the last quarter of 2015. However, in 2015 the notion of excellence created a hefty controversy between the (until August) Minister of Education, Research and Religion and the academic community, as the Minister denounced excellence as an undemocratic concept. This controversy calmed down with the new leadership of the Ministry.

There are no studies on either the leverage or crowding out effect of public funding on private R&I. All competitive schemes supporting the business sector are expected to leverage private funding with the exception of spin-offs. This is, however, difficult to achieve, so the primary target is to trigger awareness in the business sector regarding the merits of R&I.

4. Quality of science base and priorities of the European Research Area

4.1 Quality of the science base

Greek scientific publications in international journals almost tripled since 1998, rising from 4,548 publications to the record number of 11,138 publications in 2012[127]. Most publications (48.8%) were in the area of natural sciences, with an emphasis on biological and physical sciences, followed by medical and health sciences (37.6%) and engineering and technology (21.9%) [128]. Greece outperformed the EU-28 in international co-publications per thousand of population with 0.7 at the end of 2013, compared to 0.9 in Portugal and an EU-28 average of 0.5. Greece ranks 18th among EU-28 countries in terms of number of publications per thousand of population with 1.5 publications per thousand of population, compared to 1.9 in Portugal and a EU-28 average of 1.4 (2013 data)[129].

Although Greek publications account for only 2.3% of publications published in the EU and just 1% of publications in OECD countries[130], productivity of the research system[131] is high at 8,327 publications/million GERD, placing Greece in third place after Croatia and Romania. In terms of publications/FTE, Greece ranked 6th with 0,462 publications/FTE[132].

The number of references to Greek publications in the period 2008-2012 was more than four times higher (279,178) compared to the number of references in the period 1998-2002[133]. In the period 2008-2012, Greece performed above worldwide average with:

- 1.2% of Greek scientific publications (643 publications) among the top 1% of most cited publications;
- 5.4% of Greek scientific publications (2,888 publications) among the top 5% of most cited publications; and
- 10.2% of Greek scientific publications (5.442 publications) among the top 10% of most cited publications[134]. 11.5% of Greek publications were among the top 10% most cited publications in the period 2000-2013, compared to 12% in Portugal. It is worth observing that the indicator in Greece increased from 11.5% in 2008 to 12% in 2010[135].

Greek-international co-publications have increased by over 30% after 2008[136]. In 2013, Greek-international co publications were at the level of 44.6%, almost 8 percentage points above the EU-28 average of 36.4% but almost four percentage points below Portugal (2013 data)[137].

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[127] Sahini E., Malliou N., Housos N., Karaiskos D. (2014), Greek Scientific Publications 1998-2012: Bibliometric Analysis of Greek Publications in Academic Scientific Journals – Web of Science, National Documentation Centre, Chapter 2.1

[128] Sahini E., Malliou N., Housos N., Karaiskos D. (2014), Greek Scientific Publications 1998-2012: Bibliometric Analysis of Greek Publications in Academic Scientific Journals – Web of Science, National Documentation Centre, Chapter 2.5

[129] Data provided by JRC

[130] Sahini E., Malliou N., Housos N., Karaiskos D. (2014), Greek Scientific Publications 1998-2012: Bibliometric Analysis of Greek Publications in Academic Scientific Journals – Web of Science, National Documentation Centre, Chapter 2

[131] Measured by the ratio of number of publications to GERD

[132] Sahini E., Malliou N., Housos N., Karaiskos D. (2014), Greek Scientific Publications 1998-2012: Bibliometric Analysis of Greek Publications in Academic Scientific Journals – Web of Science, National Documentation Centre, Chapter 2.1

[133] Sahini E., Malliou N., Housos N., Karaiskos D. (2014), Greek Scientific Publications 1998-2012: Bibliometric Analysis of Greek Publications in Academic Scientific Journals – Web of Science, National Documentation Centre, Chapter 2.2

[134] Sahini E., Malliou N., Housos N., Karaiskos D. (2014), Greek Scientific Publications 1998-2012: Bibliometric Analysis of Greek Publications in Academic Scientific Journals – Web of Science, National Documentation Centre, Chapter 2.4

[135] Data provided by JRC

[136] Sahini E., Malliou N., Housos N., Karaiskos D. (2014), Greek Scientific Publications 1998-2012: Bibliometric Analysis of Greek Publications in Academic Scientific Journals – Web of Science, National Documentation Centre, Chapter 2.6

[137] Data provided by JRC

The share of public-private co-publications in the period 2011-2013 was at 1.5%, placing Greece in 13th position among EU-28, compared to 1.1% in Portugal and a EU-28 average of 1.8 %[138].

The issues of autonomy and fragmentation are pending at the moment: the withdrawn draft law for Higher Education was in the direction of limiting autonomy, abolishing Scientific Councils (which were introduced in 2012 aiming at a dual management function, as in all modern HEIs separating academic from financial management) and giving back a lot of power to student voting and the Senate. The way this will be resolved in the future is subject to the provisions of the new law which is expected in the first semester of 2016.

Table 5 Bibliometrics indicators, measuring the quality of the Science base[139]

Indicator	Year (2013)	EU average (2013)
Number of publications per thousand of population	1.5	1.43
Share of international co-publications	44.6%	36.4%
Number of international publications per thousand of population	0.7	0.52%
Percentage of publications in the top 10% most cited publications	10.5*	12.25% (2010)
Share of public-private co-publications	1.5%	1.8%

* Percentage of publications in the top 10% most cited publications (FULL, 2000-2013)

** Share of public-private co-publications (SciVal, 2011-2013)

4.2 Optimal transnational co-operation and competition

4.2.1 Joint programming, research agendas and calls

Greek policy favours international R&I cooperation[140]. Common research agendas are mainly driven by EU supported schemes. Greek research teams participate extensively in ERAnets and other EU initiatives and often play an important role in research agendas for grand challenges, but participation in actual common programming is limited. Budget is thinly distributed following a bottom-up approach, rather than a top-down prioritisation. It is perceived that transnational cooperation policies contribute to the quality of the research system through the familiarisation of local research staff with international practices and the exchange of methodologies and common research agendas.

Greece is currently active in 10 ERA-NET projects (including one ERA-NET Cofund), 1 ERA-NET-Plus project, and 2 Art. 169/185 network projects (2 EUROSTARS) [141]. In the period 2007-2013, GSRT launched 4 calls for ERA-NET projects, which were addressed to Greek participants in the European networks E-Rare, E-Rare 2, PV-ERANET, ICT-Agri, BS-ERA.NET, ERA.NET-RUS, ERA.NET-RUS Col, ERACOBUILD, EMIDA, ICT - Agri C-2 , SEAS-ERA C-1, TRANSCAN C-1, ERA.NET FENCO and CAPITA.

[138] Data provided by JRC

[139] Source: JRC IPTS RIO elaboration on Scopus data collected by Sciencemetrix in a study for the European Commission DG RTD (Campbell, 2013). The share of public-private co-publications is derived from the Scival platform and is also based on Scopus data (September 2015). SciVal ® is a registered trademark of Elsevier Properties S.A., used under license. The data on public-private co-publications is not fully compatible with the data included in the IUS, due to differences in the methodology and the publication database adopted.

[140] European Research Area, Progress Report 2014, pg 18

[141] NETWATCH Platform on transnational R&D programme collaboration

The calls covered the thematic areas of IT and Communications, Agriculture-Food-Biotechnology, High value products and production technologies, advanced materials-nanotechnology, energy, transport, environment, health, space technologies, cultural heritage, social and economic perception of development and the average funding per project was €115,000 [142].

Greece does not participate in any JPIs or JTIs[143]. The last related call in JPIs was launched in 2012 and funding was received from 2 HEIs for 100% funding of 3 projects. Average funding per project was € 134,000. For JTIs, 4 calls were launched in the period 2008-2010 for JTIs "ENIAC" and "ARTEMIS"[144].

Policy actions supporting joint activities are implemented in the context of INCO-ERAnets.

A new bilateral R&D protocol was signed in 2015 between Greece and Germany (€ 18m) for a three-year period. This agreement, which co-funds mixed research teams from Germany and Greece in commonly agreed priority areas, aims at enhancing the competitiveness of both countries. The agreement is expected to become operational in April 2016[145]. Discussions with France are under way.

It is estimated that 0.9% of national funding is dedicated to joint research agendas compared to an EU average of 1.42% (2013 data). Only 1% of the R&D budget was attributed to collaboration programmes with third countries (EU average equal to 0.7%-2013 data)[146].

Common ex post evaluation procedures are not implemented.

The national RIS3 places great emphasis on transnational co-operation and competition for the enhancement of the quality of local research potential. In this context, 2 initiatives are planned for the period 2014-2020:

- An initiative for the support of the participation of HEIs, RPOs, and researchers in international collaboration projects (ERANET, EUREKA, Knowledge Innovation Communities) that would otherwise have been impossible due to the overall fiscal constraints that the country faces. The programme also provides funding to researchers that participate in HORIZON 2020 projects Human Brain and Graphene, as well as to Greek companies that want to participate in industrial projects in the areas of space technology, telecoms, earth observation etc. Total budget is at €50m, funded by ERDF [147];
- Initiative for the support of research collaborations between Greek and foreign researchers in the context of signed bilateral agreements. Total budget is at €50m, funded by ERDF [148].

4.2.2 RI roadmaps and ESFRI

The reinforcement of Research Infrastructures (RIs) is among the strategic priorities of the national RIS3.

[142] Information provided during interview with GSRT
[143] NETWATCH Platform on transnational R&D programme collaboration
[144] Information provided during interview with GSRT
[145] http://www.ekt.gr/el/news/19298
[146] COMMISSION STAFF WORKING DOCUMENT, Snapshots Member States of the European Union Accompanying the document COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT European Research Area Progress Report 2014 pg. 224
[147] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 29-32
[148] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 32-33

The National Strategy for RIs prioritises the creation of a critical research mass in areas of strategic importance for Greece, the adoption of a coherent participation model in European and global RIs (including ESFRI), the implementation of RIs based on multi-annual investment plans, strong collaborations between academia and research, the establishment of well-structured governance programmes, the support of RIs at regional level and the harmonisation of all e-infrastructures for a knowledge intensive economy[149].

In December 2014, GSRT released the National Roadmap of Research Infrastructures, which included 26 RIs in 7 thematic areas: Environmental Sciences, Biological and Medical Sciences, Social Sciences and Humanities, Energy, Physical Sciences and Engineering, Materials & Analytical Facilities, e-infrastructures[150]. All participating RIs were peer reviewed by international experts based on their relevance to national and regional development and competitiveness[151], and the thematic priorities of ESFRI Roadmap. It is worth noting that only 7 out of the 26 RIs are not ESFRI related[152]. The National Roadmap of Research Infrastructures encourages open access; as a general rule, a minimum of 20% of the capacity of the RIs should be available to external users[153]. The final funding decision from Structural Funds is still pending as there are not sufficient funds for all 26 RIs.

In the period 2014-2020, Greece will participate in Research Infrastructures (RIs) programme with 68 proposals for a total EU funding of € 31.2 m. Attica will receive more than 86% of available EU funding. RPOs and private companies accounted for 86.2% of participants. E-infrastructures were the most popular project[154].

In an effort to expand Greek RIs (the Greek hub) in the areas of Computational Chemistry, Physics, Biology, Biomedicine, Meteorology, Seismology, Material Science and Social Sciences, a new High Performance Computer (HPC) was installed in the beginning of 2015 in the premises of the Ministry of Research, Education and Religion. HPC will facilitate connections with international RIs and will facilitate the participation of Greece in the Partnership for Advanced Computing in Europe[155]. The evaluation of project proposals to be used in the platform is expected in October 2015[156].

Greece participates in large European RIs such as the European Space Agency (ESA), the Conseil Européen pour la Recherche Nucléaire (CERN), European Fusion Development Agreement (EFDA), and European Molecular Biology Laboratory (EMBL). However, the ongoing financial crisis makes it difficult to keep up with annual subscriptions. Greece failed to pay its subscription to ESA for the third year (annual fees are in the area of €8m-€ 10m[157]), but paid up its contribution to CERN (€ 3 m) [158].

[149] National Roadmap for Research Infrastructures (2014), Ministry of Education and Religious Affairs General Secretariat for Research and Technology, pg. 14
[150] National Roadmap for Research Infrastructures (2014), Ministry of Education and Religious Affairs General Secretariat for Research and Technology, pg. 19
[151] National Roadmap for Research Infrastructures (2014), Ministry of Education and Religious Affairs General Secretariat for Research and Technology, pg. 74
[152] National Roadmap for Research Infrastructures (2014), Ministry of Education and Religious Affairs General Secretariat for Research and Technology, pg. 20
[153] National Roadmap for Research Infrastructures (2014), Ministry of Education and Religious Affairs General Secretariat for Research and Technology, pg. 28
[154] "Research Infrastructures 2014: Greek participation in the programme Research Infrastructures – Horizon 2020", 2015, National Documentation Centre
[155] http://kainotomia.ekt.gr/issue/2015/99/#19/z
[156] https://hpc.grnet.gr/access/preparatory-access/
[157] http://www.ictplus.gr/default.asp?pid=30&rID=40134&ct=0&la=1
[158] R&I sector, Summarised Review, March 2015-August 2015, Ministry of Culture, Education and Religion, pg. 8

In 2013 (last available data), Greece contributed 3.1 % of GBAORD to the activities carried out by CERN, EMBL, the European Southern Observatory (ESO), the European Synchrotron Radiation Facility (ESRF), the Institute Laue-Langevin (ILL) and the European Commission's Joint Research Centre (JRC), compared to 2% in 2012, and ranked 6th among EU-28 countries[159].

An assessment of these RIs is foreseen in 2015, before deciding on the funding allocation in the next programming period[160]. Emphasis will be placed on the support of existing ESFR RIs in Greece[161], whereby the implementation plan will include the gradual reinforcement of Greek RIs (the "Greek Hub")[162].

4.3 International cooperation with third countries

International cooperations are sought primarily through bilateral agreements. Such agreements have been signed between Greece-China (cooperation in the area of preservation of cultural heritage with the establishment of a Chinese Research Centre in Greece and a common research laboratory in China, being under way) and Greece-Israel (collaboration in the area of entrepreneurship and Greek thematic priorities). New R&D agreements are planned with Chile, Montenegro, and Azerbaijan[163].

Due to the unattractive working conditions of Greek scientists there is a significant brain-drain at the moment; Greece is unable to attract talented researchers from beyond the EU and is losing its own to the EU and beyond. There are limited Master and PhD programmes that attract foreign researchers, but this is more on an individual basis for personal reasons than a massive attraction thanks to policy incentives.

The role of the country in Strategic Forum for International Science and Technology Cooperation (SFIC) is rather limited. In terms of BILAT projects and Multi-Annual roadmaps Greece is more involved via consultants than the national administration.

4.4 An open labour market for researchers

4.4.1 Introduction

Based on the University Autonomous Tool (UAT) [164], Greece has medium-low organisational autonomy and low financial, staffing and academic autonomy. It is one of the few countries (3 out of total 27 countries being examined) that continue to allocate public funding in the form of a line-item budget. Institutions are unable to keep a surplus or borrow money and may only sell their non-operational buildings with external approval. This applies also to donations and endowments to universities. Greece ranks 27th out of 29 in organisational, financial and academic autonomy and 29th in staffing autonomy[165].

Law 4076/2012 introduced provisions for the enhancement of university autonomy (e.g. the introduction of an external management board for the first time) and prescribed amended regulations for the election and promotion of faculty. The current situation is unstable, as the government elected in 2015 opposed the law but has not yet introduced a new one. Autonomy is hampered but not legally changed.

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[159] Eurostat, National public funding to transnationally coordinated R&D (gba_tncoor) http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/R_%26_D_budget_statistics_-_transnationally_coordinated_research, December 2014

[160] National Roadmap for Research Infrastructures (2014), Ministry of Education and Religious Affairs General Secretariat for Research and Technology, pg. 28

[161] National Roadmap for Research Infrastructures (2014), Ministry of Education and Religious Affairs General Secretariat for Research and Technology, pg. 28

[162] National Roadmap for Research Infrastructures (2014), Ministry of Education and Religious Affairs General Secretariat for Research and Technology, pg. 25

[163] R&I sector, Summarised Review, March 2015-August 2015, Ministry of Culture, Education and Religion, pg. 8

[164] UAT was compiled at the end of 2010 using 38 indicators, categorised into four autonomy dimensions (organisational, financial, staffing, academic)- http://www.university-autonomy.eu/about/

[165] http://www.university-autonomy.eu/countries/greece/

Statistics for researchers in Greece are scarce and there is a discontinuity in reporting. At the end of 2011 (last available data), researchers accounted for about 0.92% of the active population compared to a EU28 average of 1.05%. In the same period, researchers accounted for 1.1% of total employment, compared to a EU28 average of 1.16%[166].

Supply of skilled and medium-skilled labour increased more rapidly than demand in the decade 2000-2010 and this trend is expected to continue in the current decade. A deceleration of demand, and to a lesser extent supply, for highly/medium skilled employees is expected in the period 2010-2020 [167]. Unless there is a serious restructuring and increasing investments this will nurture outmigration of skilled and semi-skilled labour.

The increase of researchers' supply is attributed to the assimilation of PhD students with researchers in HEIs with a focus on their short term employment during their doctorate studies and no concern for their research career thereafter[168].

Table 6 Labour market skills forecast-demand and supply (% change)

	Demand highly skilled (in brackets medium skilled)	Supply highly skilled (in brackets medium skilled)
2000-2010	45.6 (17.6)	51.2 (13.1)
2010-2020	9.5 (6.9)	22.4 (8.8)

Source: Innovation Union Competitiveness Report 2013

Based on the findings of the Report from the 2014 ERAC Mutual Learning workshop on Human Resource and Mobility, Greece is looking for new ways to promote research excellence in public organisations and has in place tax incentives for the hiring of researchers[169].

As pointed out in Section 4.1 the draft law for Higher Education was in the direction of limiting autonomy, abolishing the Councils and giving back a lot of power to student voting and the Senate. The way this will be resolved in the future is subject to the provisions of the new law.

4.4.2 Open, transparent and merit-based recruitment of researchers

Greece is a country with a heavily regulated labor-market for researchers with strict, administration-based remuneration rules that do not reward performance but seniority (Laws 4009/2011, 4115/2013, 4310/2014 presented below).

Law 4009/2011 is the principal law addressing the labour market for professors, including provision for their recruitment and promotion. The law promotes open, transparent and merit based recruitment; positions are advertised and the selection takes place with the assistance of panels composed of seven experts (2 national external members and 1 international external member). Evaluation takes place every 5 years by three member panels, based on their research, academic, teaching and scientific work. There is no evaluation of this law. Law 4115/2013 (art.34) introduced new provisions for the professional development of professors. The same law allowed professors to get transferred to other departments within the same or other Universities, as long as they serve for at least 3 years in the same department. Transfers are not allowed towards HEIs located in the two principal cities of Greece (Attica or Thessaloniki).

[166] Eurostat, Total R&D personnel and researchers by sectors of performance, as % of total labour force and total employment, and by sex [rd_p_perslf]
[167] Innovation Union Competitiveness Report 2013, pg. 64
[168] Action Plan for the implementation of ESETAK 2015-2021, September 2014, pg. 88
[169] Report from the 2014 ERAC mutual learning workshop on Human Resources and Mobility, Intersectoral Mobility, (Vandevelde K., March 2014)

The RDTI Law 4310/2014 (Art 29) reclassified the categories of researchers to class A, B, C[170]. The same law provided for the participation of at least 2 foreign researchers in the evaluation committees for the promotion of researchers of the highest two ranks (A' and B class). The same law set up a minimum term of 3 years in the same rank, as a prerequisite for the promotion of B class researchers and a regular evaluation of class A and class B researchers every 5 years starting from the enactment of the law. Evaluation takes place from a 3-member committee also including researchers of the same rank from Greece and abroad. Class B researchers who fail to get promoted after two consecutive evaluation periods (3 years) may apply for a permanent employment as research staff within the institution. Class C researchers are evaluated every 4 years and if they fail to get promoted after two consecutive evaluation periods (4 years) they may apply for a permanent employment as research staff within the institution. Evaluation criteria include patents, academic publications, books, conference participations, impact of research activity, funds attracted from research programmes, contribution to intellectual property rights, participation in spin offs, teaching skills, participation in tutorials, workshops, participation in the contribution of national and international collaborations in RTDI.

Law 3205/2003 regulates the salaries of public sector employees, including researchers. The highest salaries were paid by the government171. In Greece (as in Cyprus, Spain, France, Italy, Portugal, Romania, and Slovenia) salaries (on appointment) and salary rises are determined on the national level, hence there is uniformity of salaries in the public sector based on the rank and years of employment. Salaries can be topped up with research funding for competitive projects gained by the researcher.

A detailed study[172] comparing gross annual salaries of researchers in 2012 (using 2011 PPP €) gives the following overview (Table 7).

Table 7 Gross annual salaries of researchers in 2012 (in 2011 PPP €)[173]

	Average	Maximum	Median country (avg/max)	Median country	Ratio Greece/ median country
First stage researchers (up to PhD)	3079	6158	16873/21794	Finland	0.18
Recognised researchers (PhD holders not fully independent)	27111	31374	28824/35151	Finland	0.94
Established researchers (level of independence developed)	29675	33326	40072/47806	Finland	0.74
Leading researchers	33892-36600	39100-48393	51835/62093	Spain	0.65

[170] Class A researchers: contribution and design of research policy, contribution to international RTDI, management of RTDI projects, attraction of researchers, acquisition of funding for research proposals and at least 3 years experience in RTDI; Class B researchers: experience in managing RTDI projects, attracting researchers and acquiring funding for research proposals and at least 3 years experience in RTDI; Class C researchers: experience of at least 3 years in research and RTDI

[171] Remuneration of Researchers in the Public and Private sectors, (European Commission DG HR, April 2007) pg. 49

[172] MORE2 Remuneration Cross country Report, April 2013, pg. 39-46-2012 data in €PPP for Greece and 2011 data for EU average

[173] Data source: ibid.

The data reveal that before the crisis the payment of First Stage researchers was significantly lower than in other EU Member States, mainly because this was not institutionalised. Recognised Researcher's salaries were the only category close to the benchmark. Development of reputation and excellence during the further academic career does not seem to play a large role, as the ratio of Greek and EU median salaries diminishes towards those higher categories. This is partly explained by the fact that even leading researchers' salaries are determined by seniority (number of years in the job) rather than performance.

Since the sovereign debt crisis the gap to the EU has increased since researchers are civil servants whose salaries were reduced by 20-30% following the country's austerity policy obligations. Law 4093/2012 introduced reductions in the salary levels of researchers and special scientists employed by local research organisations. The reduction of salaries imposed has affected all categories and rendered researchers' salaries non-competitive, leading to brain drain.

Greece received a total score of 43% unweighted and 40% weighted in organisational autonomy of UAT[174], with relative higher flexibility in the dismissal of the executive head (80%), the capacity to decide on academic structures (60%) and to establish other legal entities (60%). In terms of staffing, Greece received an overall score of 14% unweighted and 13% weighted, with higher flexibility in the promotion (43%) and the recruitment procedures (33%) of senior academic staff (43%)[175].

There is a national accreditation mechanism for degrees obtained outside the country, which created some discrepancies. For instance, Bachelor and Master Degrees obtained in the UK are recognised only as a Bachelor Degree in Greece because undergraduate studies have four year duration. This applies universally and not only for researchers. Language barriers are crucial, as only few courses are taught in English (only at graduate level). There is no habilitation.

In general career conditions are not attractive and as a consequence there is very limited demand for permanent research positions of foreign citizens. There is, however, an observable number (no specific evidence on trends) of European and US professors giving lectures or teaching modules in graduate courses.

The impact of the crisis is devastating for the Greek researchers: Based on a survey conducted by ICAP in the period April-May 2015, it is estimated that about 200,000 new scientists have left Greece in the period 2010-2015, 10% of the available research potential of the country, and 2% of the population. It is the biggest brain drain on a global scale[176]. The survey sample included 1,325 people (42% women, 58% men) from 56 countries, 43% of the respondents had worked in Greece before leaving the country and 63% of the respondents had left the country in the last five years. Low meritocracy and corruption were the principal reasons for leaving the country (37% of the respondents), followed by the ongoing financial crisis in Greece (33% of the respondents) and the higher professional expectations offered abroad (33% of the respondents). IT, training and research were the sectors that could benefit the most from repatriation. It is worth mentioning that 88% of the respondents had at least a graduate degree (73% at postgraduate and PhD level)[177].

The significant outflow of researchers has also caused a major problem to the operation of HEIs; according to press releases, out of the total 9,000 professors and assistant professors in Greece (2012 data), 1,200 have already left the country and another 400 will leave by 2016.

[174] Weighted by the importance of each indicator included in each of the four dimensions.
[175] http://www.university-autonomy.eu/countries/greece/
[176] 1st Human Capital Summit, Talent Management from drain to gain, Nikitas Constantellos CEO ICAP Group
[177] 1st Human Capital Summit, Talent Management from drain to gain, Nikitas Constantellos CEO ICAP Group

According to Labrianidis (2013), 40% of the people that have migrated abroad currently work for HEIs/ research centers and research departments of multi-national companies. Most common reasons for migration were better work prospects, field specialisation, the enhancement of knowledge and technical knowhow and better remuneration[178].

During the period 2010-2012, inward and outward mobility was only supported by the measure "Support of Postdoctoral Researchers". A call was launched in November 2012 by the Ministry of Education, Research and Religion to respond to a Call for Proposals for participation in the Pilot Programme for the mobility of young researchers of the Mediterranean Office for Youth (MOY). The call was addressed to HEIs in Greece. PD 128/2008 prescribed the process by which third party nationals may be received for research in national research institutions.

The programme 'Career offer to Greek-speaking researchers from abroad' provides financial support in the form of grants to Greek speaking researchers from abroad, aiming to incorporate them into the Greek RTD system. In addition, Law 2004/2011 enables national researchers to take a sabbatical leave for up to three years to participate in research projects abroad. An estimated 10% of researchers make use of this opportunity.

Law 4009/2011 (Art 2011) introduced the idea of scientific leaves enabling researchers to engage in research abroad for one year if researchers have been employed for a period of at least 6 years or 6 months for a total employment of at least 3 years. During the leave, researchers may receive their salary in full or even to an up to 80% increase provided their research is not funded by grants or the foreign HEI. Upon their return, they should work for at least three years in the same HEI or else their funding during the leave may be claimed by the HEI. The new RTDI Law 4310/2014 (Art. 28) renamed scientific to research leaves. Leaves of up to 3 years (unpaid) may be granted to researchers for the commercialisation of their research ideas but then they have to return to the HEI or RPO in full employment or else resign.

Law 4009/2011 (Art.16) prescribed permanent positions for professors and associate professors. Assistant professors are appointed for a term of 4 years renewable for another 4-year period. HEIs also offer the possibility to PhD graduates to undertake teaching positions for a maximum of 5 consecutive years in a HEI, under renewable one to three-year part time or full time contracts. Law 4009/2011 (Art. 23) allows the employment of professors under temporary contracts when they serve for at least three years from their appointment in the same rank and awards them 35% of the regular salary. Law 4310/2014 (Art.83) granted temporary status to professors even before the completion of 3 years from their appointment, only by way of exception and until 30.08.2016. Professors under both temporary and permanent contracts are subject to social security and health insurance; only subcontractors pay on their own for social security and health insurance.

Professors under temporary contracts should have a permanent employment elsewhere in the private or public sector. Professors under permanent contracts must reside in the city where the HEI is located.

Researchers may be employed under permanent or temporary contracts. Based on a MORE II study, permanent contracts are only available for established and leading researchers. In fact, leading researchers are only employed under permanent contracts. First grade researchers up to the PhD level have fixed term contracts (less than one year), second grade researchers at PhD level but not completely independent and established researchers have fixed term contracts in excess of 4 years[179]. Researchers must remain at the RPO for at least 20 hours per week, allocated into 4 days per week (Art. 18 Law 4310/2014)

[178] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, pg. 36
[179] MORE2 Remuneration Cross country Report, April 2013, pg. 49

Despite recent signs of improvement, the ongoing financial crisis still creates a very unstable environment for young researchers. The government introduced in 2015 measures for the enhancement of youth employment and skills in the private sector:

- two programmes of early intervention and activation are implemented under the OP "Human Resources Development, Education and Lifelong Learning 2014-2020" for young unemployed, aged from 18 to 29 years (subsidies programmes through voucher)[180];
- subsidy programmes to businesses[181]; and
- a Youth Guarantee Scheme with a budget of €171m for Greece[182].
- Initiatives for the return of expatriate scientists were prepared in the context of OP Competitiveness and Entrepreneurship and OP Education and Life-Long Learning for the period 2014-2020: support of PROs, international collaborations, bilateral contracts and incentives to researchers for staying in Greece. First calls are expected in October 2015[183].

There are no programmes directly creating employment opportunities for young researchers; ARISTEIA II for the support of excellent scientific networks in Greece indirectly creates indirectly opportunities for collaborations with industry. IRON did the same on PhD and Master degrees level. Also, the national RIS3 supports indirectly employment opportunities of young researchers through the initiative for the support of RTDI collaborations between RPOs, HEIs and businesses for the production of innovative products and processes (see Chapter 3.5.1 above)

4.4.3 Access to and portability of grants

In Greece portability of national grants to other EU countries is not allowed[184] but it is allowed between national research organisations (two FP7-ERC Starting Grant holders requested and were granted grant portability to another Greek institution)[185]. Application for grants is open to Greek and foreign candidates, provided that the research institution where they will work is established in Greece[186].

4.4.4 Doctoral training

According to Law 4009/2011 (Part IV) HEIs are free to develop their doctoral training programmes and may increase their quality through collaborations with national and foreign HEIs and RPOs[187].All programmes need, however, approval from the Ministry of Education, Research and Religion. The authorisation is requested in order to ensure compliance with quality criteria but also make sure that programmes are not started and scrapped if the Ministry is unable to provide the funding individual departments are expecting. Hence the application-authorisation process is a matter of clarity and transparency. Graduate programmes that can be self-financed are not refused.

While the ERAC Mutual Learning Report lists Greece among the countries where researchers have sufficient demand from the non-academic sector, employers in SMEs and in different sectors of the economy very often appreciate the added value of a doctoral degree [188]. Doctoral training is often pursued as a means for securing employment outside HEIs.

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[180] Greek National Reform Programme, April 2015, pg. 45
[181] Greek National Reform Programme, April 2015, pg. 46
[182] Greek National Reform Programme, April 2015, pg. 47
[183] R&I sector, Summarised Review, March 2015-August 2015, Ministry of Culture, Education and Religion, pg. 6
[184] Researchers' Report 2014 Country Profile: Greece, (Deloitte, 2011), pg. 14
[185] Pascual C., Sachini E. (2015), "7 years of Excellence in the European Research Area 2007-2013: the case of Greece", National Documentation Centre, pg. 55
[186] Researchers' Report 2014 Country Profile: Greece, (Deloitte, 2011), pg. 14
[187] Researchers' Report 2014 Country Profile: Greece, (Deloitte, 2011), pg. 10
[188] Report from the 2014 ERAC mutual learning workshop on Human Resources and Mobility, Intersectoral Mobility, (Vandevelde K., March 2014)

There are contradicting indications regarding the effectiveness of this strategy however, including labour market studies, the share of PhD holders working in the private sector, and the share of PhDs emigrating. In addition, employers may state that they value PhD holders, but are not employing them according to their qualifications.

The financial crisis in Greece has led to limited funding of doctoral training and almost no funding of post-doctoral research[189]. Many doctorate students are forced to work in parallel with the doctoral studies and this poses a constraint on their research activity[190]. In the National Technical University of Athens only 10% of doctorate students receive fellowships, while a considerable share of the others are funded by research contracts of their supervisors[191].

Some PhD programmes follow the principles of Innovative Doctoral Training (IDT) by coincidence while others comply implicitly with some of the seven principles[192]. No HEI has announced a formal adoption of the IDT principles at the institutional level. Funding and the lack of human resources are acknowledged as major barriers for the implementation of IDT[193].

4.4.5 Gender equality and gender mainstreaming in research

In order to address gender imbalances in the decision-making processes, Law 2839/2000 introduced provisions for the balanced participation of men and women in the Public Sector, Public and Private Law entities, as well as in municipalities. Law 3653/2008 (art. 57) addressed gender imbalances in the decision-making process in the research sector for the recruitment from National bodies, Research and Technology Committees, provided that the candidates have the same qualifications.

In Greece in 2009, there were 36% of women researchers[194]. The annual compound growth of women researchers in the period 2002-2009 (last available data) was less than men (8.1% compared to 9.7%)[195]. Women are under-represented in scientific and administrative boards, ranking almost last among EU28 with only 14% of heads of institutions being women (2014 last available data).

By 2013, 30% of Greek RPOs had adopted gender equality plans. In these RPOs R&D personnel accounted for 27% of total staff,

The National Programme for Gender Equality 2010-2013, adopted in 2010, ensured the provision of equal opportunities to women in the workplace and in life. The programme acknowledged amendments to legislation, while specific project actions were undertaken by the General Secretariat of Gender Equality and interventions in other Ministries and public authorities (gender mainstreaming)[196].

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[189] Exploration of the implementation of the Principles for Innovative Doctoral Training in Europe, (European Commission DG RTD, 2011), pg. 24

[190] Exploration of the implementation of the Principles for Innovative Doctoral Training in Europe, (European Commission DG RTD, 2011), pg. 50

[191] Exploration of the implementation of the Principles for Innovative Doctoral Training in Europe, (European Commission DG RTD, 2011), , pg. 53

[192] COMMISSION STAFF WORKING DOCUMENT, Snapshots Member States of the European Union Accompanying the document COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT European Research Area Progress Report 2014 pg. 229

[193] European Commission, DG RTD, Study Visit, Institution: National and Technical University of Athens, Country: Greece, Case study undertaken in the context of the 'Exploration of the implementation of the Principles for Innovative Doctoral Training in Europe' (Tsipouri L. and Bodard E., September 2013), pg. 14

[194] European Commission She figures 2012, Gender in research and innovation, Statistics and Indicators, pg. 27

[195] European Commission She figures 2012, Gender in research and innovation, Statistics and Indicators, pg. 27

[196] ERA Communication Fiche Greece, 2014

The gender dimension was strengthened also by the PENED programme (1996-1998) and by the Heraclitus programme (2010-2015) which favoured young researchers giving them additional bonuses. The Eurydice project (2008-2011) provided scholarships to young women in sectors traditionally dominated by men[197].

In 2006, GSRT created the Periktioni network for the servicing of women researchers and scientists in Greece and the whole Mediterranean, Balkan and Black Sea region. Art. 57 L.3653/20008 was introduced at the initiative of this network[198]. Members of this network are 100 female researchers of high caliber[199].

Individual research teams participate actively in EU-based gender-related projects.

4.5 Optimal circulation and Open Access to scientific knowledge

4.5.1 e-Infrastructures and researchers electronic identity

The Greek Research and Technology Network (GRNET), national member of the National Research and Education Network (NREN), facilitates Computing and Cloud Services. GRNET coordinates, has developed and operates its own public IaaS cloud solution named Okeanos, offering cloud resources to the Greek Universities[200]. GRNET has signed cooperation agreements with core network ABILENE and the consortium of 200 US Universities for access and participation in Internet2 (a collaboration of research, academia, industry and government in innovative technologies)[201].

There is no national policy on e-identity. However, GRNET cooperates with the Ministry of Education, Research and Religion for the development of e-identity among researchers (funding from the OP Digital Convergence 01.07.2012-31.10.2015). Greece participates through GRNET in eduGain, a group of institutions and organisations using Authentication and Authorisation Infrastructures (AAIs) to build a trusted environment where users can be identified electronically using a single identity. More than 50% of RPOs provided in 2013 federated identities of their researchers[202].

There is no national strategy to address personal data security. GRNET has launched in 2013 a programme for the development or/and upgrading of Catalogue Services and Authentication and Authorisation Services within HEIs and RPOs linked with GRNET for the safeguarding of personal data of the academic community while using their institutional account (funding from OP Education and Life-Long Learning)[203].

The national RIS3 includes initiatives for the enhancement of e-infrastructures, and more specifically:

- for the development and operation of a cloud based digital R&I platform in open access technology, which will encompass all research projects and results delivered in the period 2007-2013, as well as the projects/result will be concluded in the period 2014-2020, the registry of Evaluators classified by research area and the National Registry of RIs. Total budget will amount to € 1m and will be funded by ERDF[204];
- For the upgrading of existing RIs of HEIs and RPOs with a total budget of € 15m, funded by ERDF[205].

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[197] http://download.steinbeis-europa.de/@gendera_news/Greece_GENDERA_preamble_final.pdf
[198] http://download.steinbeis-europa.de/@gendera_news/Greece_GENDERA_preamble_final.pdf
[199] http://www.ekt.gr/news/events/ekt/2011-11-23/presentation_dafna.pdf
[200] https://www.grnet.gr/, December 2014
[201] GRNET Annual Report pg. 11
[202] European Research Area, Progress Report 2014, pg. 55
[203] GRNET Annual Report pg. 30
[204] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 21-23
[205] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 26-27

4.5.2 Open Access to publications and data

In terms of e-government development, Greece belongs to the middle group of countries at international level, whilst refraining from the first group only a few points. In particular, Greece is at the 36th position among 102 countries in the Open Governance Index 2015, according to the World Justice Project, with a 0.57 rating out of 1, while the threshold for the first group of countries has been 0.61. A rise in the index of the publication of laws and open data (0.43 current performance and 69th position among 102 countries) shall significantly improve the overall performance of Greece, as its other indicators are greater than 0.60 (right to information 0.62, political participation 0.63 and complaint mechanisms 0.60). Furthermore, Greece is at the 31st position among the 86 countries of the ranking list, based on the market research study of Open Data Barometer in 2013 (Open Data Barometer). In fact, compared to FY 2013, Greece has shown an upward trend, reverting its ranking by +6 positions, with a total score of 40.79 (an increase of 13.2 points in comparison with trends recorded in 2013). Greece's position derives mainly from the Transparency Program Initiative "DIAVGEIA" [https://app.diavgeia.gov.gr/en], while it is proven that the available open data relating to public expenditure are more frequently viewed[206].

Law 4305/2014 (Art. 33) introduced open access to all data published by the public sector. The draft Action Plan of ESETAK (the national R&I strategy) called for open access in all documents (information, publications, content) produced through public funding. Researchers funded by public funds must provide open access to their research material within 12 months from the publication of ESETAK and make a digital copy of their research work available in thematic repositories acknowledged internationally in the science field where the research was conducted or in institutional open access repositories[207]. Although ESETAK was never adopted formally the commitment to Open Access and Open Data is increasingly gaining momentum, but more in terms of commitments than actual implementation.

The National Documentation Centre(NDC) is a pivotal organisation for the support of open access in Greece. Its e-publishing facility is open to all Greek researchers wishing to join[208]. The larger HEIs subscribe to the major scientific journals and faculty members and students have access via the intranet of the institution. E-Journals are circulating, but remain marginal compared to traditional journals accessed via the web. In 2010, NDC signed the Alhambra Declaration for the enhancement of open access policies through the creation of national task force committees.

NDC converted Biblionet to a new Open Access Public Catalogue (OAPC) with access to new book titles in Greece. Biblionet includes more than 190,000 book titles[209]. Also, NDC is a partner and leads the fifth work package of the Policy Recommendations for Open Access to Research Data in Europe (RECODE) project, related to the production of guidelines that identify, promote and disseminate open access policies. These guidelines will be incorporated into the final recommendations of the RECODE project[210].

In April 2013, the Greek Open Knowledge Foundation Network (OKFN) was created, following an initiative from the Aristotle University of Thessaloniki. The Greek OKFN focuses on open linked data and aims to enhance governance of local research procedures, and improve transparency and access to research, cultural and financial data[211].

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[206] Kokkinoplitis Konstantinos (2016), Open Data in Greece, Report to the European Commission, DG Regional and Urban Policy, Unit I3 – Greece and Cyprus, January 2016

[207] Action Plan for the implementation of ESETAK 2015-2021, September 2014, pg. 14

[208] http://epublishing.ekt.gr/el, December 2014

[209] http://kainotomia.ekt.gr/issue/2015/99/#15/z

[210] http://recodeproject.eu/partners/, December 2014

[211] http://gr.okfn.org, December 2014

Greece supports gold and green open access to publications and a working group has been set up under the auspices of GSRT[212].The majority of open access papers in Greece in the period 2008-2013 were other type (3,067 papers, 72.2% of total OA papers and more than 38% of total accessed papers), based on a sample of accessed papers (8,043). Gold journals came second, accounting for 18.2% of OA papers and 9.6% of total accessed papers. OA papers were 52.8% of total[213].

According to the information in ROARMAP, two Greek institutions thus far have an explicit OA mandate (Panteion University and Archimedes Centre for Modelling, Analysis and Computation)[214]. About 85% of RPOs make frequently or occasionally available online and free of charge publicly funded scientific research data (2013)[215].

In a survey conducted by Science-Metrix using DOAJ, PubMedCentral, and Scopus regarding papers published on open access in the period 2008-2011 among EU 27 Member States, Greece ranked above average with over 100,000 records contained in institutional repositories[216]. In October 2015, the total number of records included in 29 institutional repositories had exceeded 491,000 compared to 395,000 included in 21 repositories in 2014 (24.5% increase)[217].

Table 8 Documents included in the 29 institutional repositories

Repository name	Num. Recs.	Pub.	Conf.	Thes.	Unpub.	Other
ACMAC	239		+			
Acropolis Educational Resources Repository	271	+				+
Anemi	11,587					+
Aristotle University of Thessaloniki Institutional Repository - IKEE	81,329	+	+	+		+
Aristotle University of Thessaloniki Repository - Psifiothiki	131,176	+		+		+
Digital Library of Modern Greek Studies	11,539	+				+
Digital Repository of Hellenic Managing Authority of the Operational Programme "Education and Lifelong Learning" (EDULLL)	1,196	+			+	+
Dione (Διώνη)	5,775			+		
DSpace at NTUA	39,988			+		+
E-Locus	5,643			+	+	
Educational Repository - University of Patras	40		+			+
Ergani-Historical Archive of Aegean Repository	1,574				+	+
ESTIA	2,487			+		

[212] European Research Area, Progress Report 2014, pg. 43
[213] Proportion of Open Access Peer-Reviewed Papers Papers published in Peer-Reviewed Journals at the European and World Levels 1996-2013, October 2014, Science Metrix, pg. 26
[214] http://roarmap.eprints.org/, October 2015
[215] European Research Area, Progress Report 2014, pg. 45-46
[216] Open Access Strategies in the European Research Area, produced for the European Commission DG Research & Innovation (Caruso J., Archambault A. and E., , August 2013)
[217] RIO Country Report Greece 2014

Repository name	Num. Recs.	Pub.	Conf.	Thes.	Unpub.	Other
Eureka!	6,596	+			+	+
European Documentation Centers (Κέντρα Ευρωπαϊκής Τεκμηρίωσης)	729				+	
FOSS Repository	318		+			+
Grey Literature Digital Library at the National and Kapodistrian University of Athens	3,144			+		+
HEDI (Hellenic National Archive of Doctoral Dissertations)	31,516			+		+
HELIOS Repository	6,776	+	+			+
Kosmopolis	51,185					+
Levadia Central Public Repository	142					+
Medusa Digital Repository	4,881	+				+
Nemertes	8,160		+	+	+	
Pandektis	40,583					+
PANDEMOS	5,755	+	+	+		+
Pergamos Digital Library	24,782	+			+	+
Psepheda: Digital Library & Institutional Repository	13,659		+	+		+
Public Central Library of Serres Repository	464				+	+
SysSec Project Publications	201		+		+	+
The Parthenon Frieze Repository	137					+
TOTAL	**491,872**					

Source: http://www.opendoar.org/find.php

5. Framework conditions for R&I and Science-Business cooperation

5.1 General policy environment for business

Greece ranks 33.3% away from the frontier[218] constructed from the best performances across all economies and across time in doing business (2015), and slightly improved compared to 2014 (35.0%). Greece ranks 52 out of 189 economies in the World Bank indicator "Starting a business", principally due to the low cost for concluding the whole procedure at 2.2% of per capita income, compared to an EU and Central Asia average of 5.3% and OECD average of 3.4%[219].

Among EU countries, Greece has the lowest ranking (91st position out of 148 countries) in World Economic Forum (WEF) Global Competitiveness Index 2013-2014, though it has gone up 5 places compared to 2012-2013. The index for "innovation driven economy" is the lowest in EU-28 in terms of the macroeconomic environment[220].

In Greece, there are no special rules in existing insolvency regulations for the support of the financial reorganisation of enterprises. Bankruptcy procedures are yet to be simplified[221], but they make a distinction between honest and fraudulent entrepreneurs. Special discharge proceedings exist and take on average 120 months. However, discharge proceedings do not protect entrepreneurs since any unsatisfied creditor can start new proceedings after the end of the liquidation period[222]. The revision of insolvency regulations is under way and establishment of insolvency courts is expected by 2017.

5.2 Young innovative companies and start-ups

Start-ups are a hope for the rejuvenation of the sectoral composition of the economy and are attractive to the young, educated unemployed Greek. For this reason a significant number of initiatives and incentives constitute a new eco-system with limited performance as yet but still promising and with high ambitions.

There are policies and instruments aiming to create a more favourable environment for SMEs, including the Support for R&D in groups of small and medium-sized enterprises (SMEs) (2009-2015), Creation (2009-2015) and PAVET 2013 described in detail under Chapter 3.5.1 above. An Innovation Voucher Scheme ran from September 2009 to 2012 and supported 286 projects. A new scheme is expected in the current programming period (see Chapter 3.5.1 above).

Endeavour Greece was established in September 2012 as a non-profit organisation, for the support of entrepreneurship in Greece (established businesses) through mentorship, strategic advice, inspiration and introduction to investors and markets. Single selection criterion is a solid turnover between € 500,000-€15m. A Board of Directors composed of reputable Greek businessmen across a variety of industrial sectors manages the organisation[223]. The organisation has created 3,500 jobs in 2014 and will have created 15,000 jobs by 2017, 80% of which outside Athens. 11 companies are listed in its network[224].

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[218] 66.7% Distance to Frontier index

[219] http://www.doingbusiness.org/data/exploreeconomies/greece/ - starting-a-business

[220] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, pg. 13

[221] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS , Review of the "Small Business Act" for Europe, 2011, pg. 5

[222] Bankruptcy and second chance for honest bankrupt entrepreneurs, Greece (Maroulis N., 2014)

[223] http://endeavor.org.gr/en/mission2, December 2014

[224] http://endeavor.org.gr/wp-content/uploads/2015/08/Endeavor-Greece-Infographic-2-years.jpg

Networking initiatives, which emerged in 2014, include:

- "Innovation Expert-Innovation in Action", an initiative of the Hellenic Federation of Enterprises (HFE) for the support innovation in Greek enterprises through networking and lectures. The objective was to include in the initiative 460 executives from 230 companies, irrespective of their sector, operating in the areas of Eastern Macedonia and Thrace, Ipeiros, Thessaly, Ionian Islands, Western Greece, Peloponnese, North Aegean, Crete, Central Macedonia and Attica;
- In May 2014, INNOVATHENS was established. Six associations of 317 innovative companies [225] participated at the end of December in INNOVATHENS, while Samsung Electronics sponsored the initiative. The hub also cooperates with Innovation and Entrepreneurship departments of Greek HEIs[226]. INNOVATHENS is financed by structural funds (NSRF 2007-2013)[227];
- GSRT and the Hellenic Federation of Enterprises (HFE) signed a strategic partnership agreement for research, technology development and innovation. Under this agreement HFE undertook the responsibility to draft within two months (by December 2014) an action plan for the creation of an Innovation Development Network[228].

Si-cluster and Gi-Cluster for space technologies and gaming and creative content respectively were created in 2014, as presented in detail in Chapter 2.3 above.

The national RIS3 prioritises the support of young innovative companies and SMEs with the establishment of competence centres, the support of restructuring and technological development of SMEs, the funding of SMEs which failed to obtain funding from EU programme SME instrument and the provision of support and incubation services (see Chapter 3.5.1. above). An initiative purely addressing innovation is the funding for the establishment and development of innovative start-ups for a period of 1-4 years. Budget is set at € 540 m and will be provided by ESF, the Initiative for Youth Employment (also funded by ESF) and the European Agricultural Fund for Rural Development (EAFRD)[229]. Innovative cluster projects through collaborations between academia and businesses will also be supported (see Chapter 3.5.1. above). IT clusters, e-entrepreneurship clusters in businesses, HEIs and RPOs will be supported by subsidies or innovation coupons. Total budget of the initiative is at € 144m and it is funded by ERDF[230].

Indirect support will also come from the initiative for the enhancement of role and activities within HEIs and RPOs for the provision of training in innovation and entrepreneurship at graduate and post graduate level, the provision of co-working spaces, the participation in the operation of incubators, accelerators, the provision of RTDI services to the business sector, the support of research groups for the exploitation of research results, the development of mentorships and business angels networks, the organisation of business ideas competitions, the enabling of networking . The programme will be co funded by the public and private sector (70/30). Budget is set at € 13.9 m and will be provided by ERDF. Maximum funding per project ranges between € 300,000-€700,000[231].

The government is preparing the establishment of a new Research and Innovation Fund for the enhancement of the research potential of the country, taking into account the priorities set out by the smart specialisation strategy and its local productive capacity.

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[225] Hellenic Mobile Cluster, Hellenic Semiconductor Industry Association, Hellenic Biotechnology Association, Greek Association of Space Technology Industries and Hellenic Start-ups Association

[226] http://www.technopolis-athens.com/web/guest/innovathens/whoweare, December 2014

[227] http://www.ekt.gr/content/display?ses_mode=rnd&ses_lang=el&prnbr=89097, December 2014 http://www.innovathens.gr/innovathens/, December 2014

[228] http://www.sev.org.gr/Uploads/pdf/keimenoProgrammatikisSymfonias.pdf, December 2014

[229] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, Annex 1, pg. 37

[230] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, Annex 1, pg. 48-50

[231] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, Annex 1, pg. 25-26

Free quality research, new researchers (i.e post graduate scientists) and strategy plans of research organizations will be the first initiatives to be funded by this Fund with a total budget of €300m in the period 2016-2016. Funding will be provided jointly by EIB and the new NSRF (Juncker package) [232].

In November 2014, Greece hosted for the second time the international competition "Creative Business Cup", aiming to strengthen talented entrepreneurs and promote new and original ideas in creative industries[233].

Because of the high unemployment, in particular among young graduates, ESIF are expected to contribute significantly to start-up creations in the 2014-2020 period.

5.3 Enterpreneurship skills and STEM policy

Amidst the on going financial crisis, tertiary education attainment level in the age group 25-64 years old has been steadily increasing in Greece from 22.8% in 2008 to 25.4% in 2011 and 28.1% in 2014, compared to an EU 28 average of 29.3%[234]. Most of R&D personnel are employed in the areas of Engineering and Technology (33.6% of total), followed by Social Sciences and Humanities (27.1% of total) and Medical and Health Sciences (20.1% of total) (2011 data)[235]. At the same time, top area in terms of R&D expenditure is Engineering and Technology (38.6% of total), followed by Medical and Health Sciences (25.4% of total) and Social Sciences and Humanities (18.5% of total)[236].

Graduate studies were massively supported by the Structural Funds in the previous programming period and a significant number of Master and PhD degrees have been created. They are now, due to the crisis, revisited by the Ministry and they are expected to be streamlined. There is no list or repository of all graduate programmes in the country. NRP 2015 foresees the design of a new map in Higher Education and Research, in accordance with the development plan of the country[237].

There are measures to support training in businesses but not specifically related to SMEs, in an effort to combat the increased unemployment.

Business Plan contests are proliferating. In 2015, the open competition "i-bank, innovation and technology", organised for the 5th year in 2015 by National Bank of Greece in collaboration with seven HEIs (National and Kapodistrian University of Athens, National Technical University of Athens, University of Athens, Aristotle University of Thessaloniki, University of Patras, University of Crete, University of Piraeus) experienced a record of participations with the submission of 422 proposals from people in the age group 18-35 years old. E-entrepreneurship was the most popular field, followed by Environment and Culture. Ten cash prizes were awarded [238]. The 2nd Science and Innovation Festival was organised in Athens in March 2015 and the 1st Science Festival was organised in Thessaloniki in May 2015. Both Festivals were sponsored by NDC and aimed at familiarising science with society[239].

There is no systematic public domain evidence on specific education and training curricula in higher education which are focusing on equipping people with the capacity to learn and to develop transversal competences.

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[232] R&I sector, Summarised Review, March 2015-August 2015, Ministry of Culture, Education and Religion, pg. 9

[233] http://www.ekt.gr/content/display?ses_mode=rnd&ses_lang=el&prnbr=89608, December 2014

[234] Eurostat, Population with tertiary educational attainment level by sex and age [edat_lfse_07]

235 Eurostat, Total R&D personnel and researchers by sectors of performance, sex and fields of science [rd_p_perssci]

236 Eurostat 2011 data, Total intramural R&D expenditure (GERD) by sectors of performance and fields of science

[237] Greek National Reform Programme, April 2015, pg. 32

[238] First prize € 20,000, second prize € 10,000, third prize € 6,000, and fourth prize € 4,000 and € 1,500 to six other groups.
http://kainotomia.ekt.gr/issue/2015/99/#9/z

[239] http://kainotomia.ekt.gr/issue/2015/99/#10/z

5.4 Access to finance

The Greek market has never been attractive to private venture and equity funds. This is the reason why public interventions for the creation of funds of funds were adopted. The recent financial crisis and the shortage of capital have minimised financing from venture capital (venture capital as % of GDP was practically equal to zero in 2014)[240]. Funding for incubators usually comes from JEREMIE Funds and the private sector (see Chapter 3.5.1 above).

The angel market in Greece is the 6th smallest in the EU with €2.1 m of investments in 2013 and € 1.5 m in 2012. Average investment size per business angel is at about €40,300[241]. A network for business angels has recently been created by the Chamber of Industry and Trade. There are fiscal incentives for VCs; management fees of VCs are exempted from VAT, capital gains tax is at 20% compared to the Greek corporate tax rate of 26% (at which corporate capital gains are normally taxed)[242]. Banks are at the moment undercapitalised and unable to make significant movements in the direction of VC.

The Innovation Fund established in June 2012 by the Ministry of Education Research and Religion and the Ministry of Economy, Transport and Tourism with a total capital of €30m has not kicked off yet. The national RIS3 provides for the establishment of a Patent Pool Fund for the commercialisation of research ideas and results. Funding will be provided by the private and the public sector (through ERDF). Total budget is set at € 40m[243].

5.5 R&D related FDI

There are no specific policies for attracting R&D intensive FDI. The overall level of FDI in the country is decreasing. Any company wishing to exploit R&I initiatives, no matter of its origin, has access to the general grants for the business sector.

5.6 Knowledge markets

Patent applications and grants are very low in the country, let alone in the EPO and US PTO. The cost of patenting in the country is affordable but the limited size of the market makes patenting less relevant for Greek companies. Those with promising patents patent immediately abroad.

Law 4310/2014 (Art.26) provides for the creation of a specialised office within GSRT, which will:

- Support RPOs in the filing of patent applications;
- Schedule training programmes of at least three years, in cooperation with foreign RPOs, in patent regulations and accreditation of respective graduates in patenting. The specifics of the programmes (curriculum, election criteria etc.) will be described by subsequent decision of the Minister of Education and Religious Affairs; and
- Promote the establishment of patent funds through collaboration between private and public sector.
- Law 3842/2010 introduced tax exemptions for a period of three years of profits derived from patented products or services[244].

[240] EVCA 2014, European Private Equity Activity
[241] EBAN: Statistics Compendium 2014
[242] EVCA Tax Benchmark Study 2012, June 2013
[243] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 59-60
[244] Legislation on patenting, designs and prototypes for technology transfer, December 2014, Industrial Property Organisation, pg. 158

In February 2013, Greece signed the international agreement for the establishment of a Unified Patents Court, along with 24 other EU member states[245].

The Organisation of Industrial Property organises information and awareness raising events regarding the process and value of patenting.

5.7 Public-private cooperation and Knowledge transfer

5.7.1 Indicators

BES-funded/publicly-performed R&D

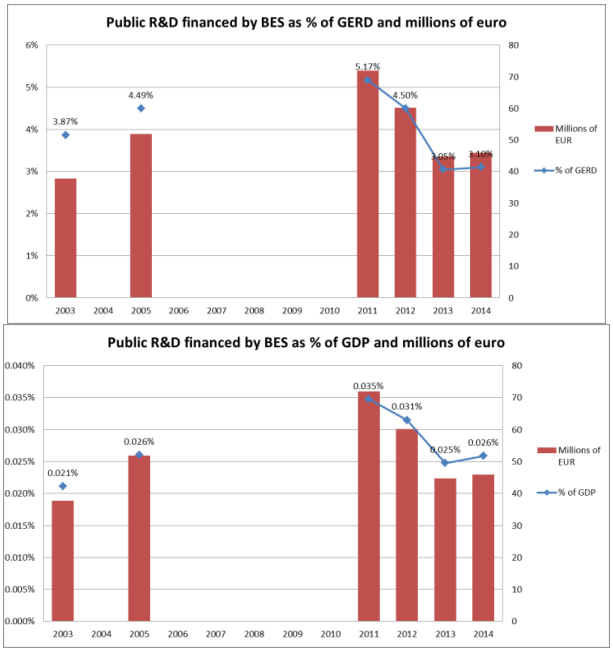

Figure 14 BES-funded public R&D in Greece as % of GERD (in €MLN) and % of GDP

The level of Greek business enterprise (BES)-funded public R&D expenditure as a percentage of GERD, as well as of GDP, declined sharply between 2011 and 2013, and stagnated in 2014 at 3.1% and 0.026%, respectively.

Both indicators were not reported in 2004 and between 2006 and 2010, which prevents an analysis of the longer-term trend.

[245] http://ec.europa.eu/internal_market/indprop/patent/ratification/index_en.htm#fn1, December 2014

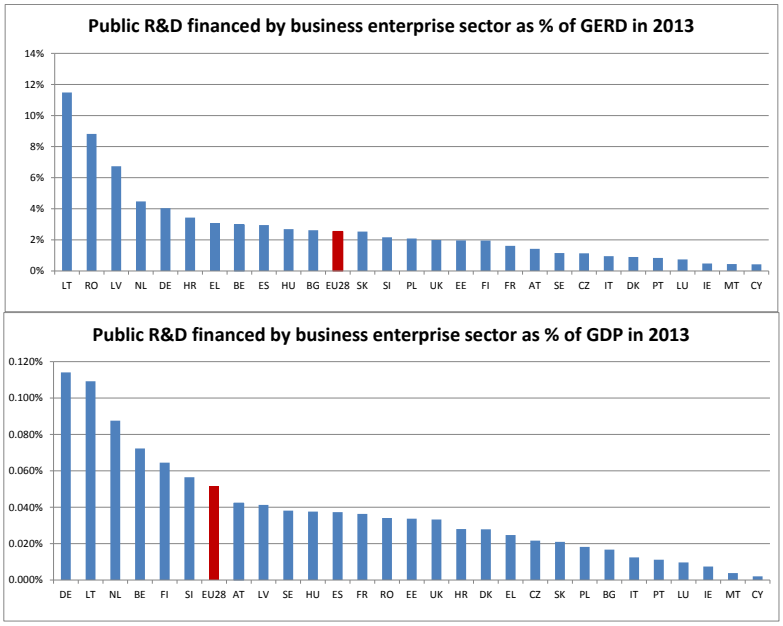

Figure 15 BES-funded public R&D as % of GERD and as % of GDP in 2013 in Member States[246]

The two charts in Figure 15 show the values of BES-funded public R&D in all EU-28 as percentages of GERD and GDP respectively.

Whereas Greece's level BES-financed public R&D as percentage of GERD is slightly above the EU average, it is substantially below if measured as percentage of GDP .

The low level of the BES-funded public R&D indicator expressed as percentage of GDP can be explained largely by the low overall R&D activity of the private sector, which has its roots in the structure of the economy, but also in the limited capacity for investment of private businesses during the economic crisis. In terms of BES-funded public R&D as percentage of GERD, Greece is placed in an upper mid-field position. However, given the low amount of total GERD, this relative indicator might not be overly instructive in the case of Greece.

246 2013 was chosen as the latest data series providing a full comparison within EU-28.

Structural funds devoted to knowledge transfer

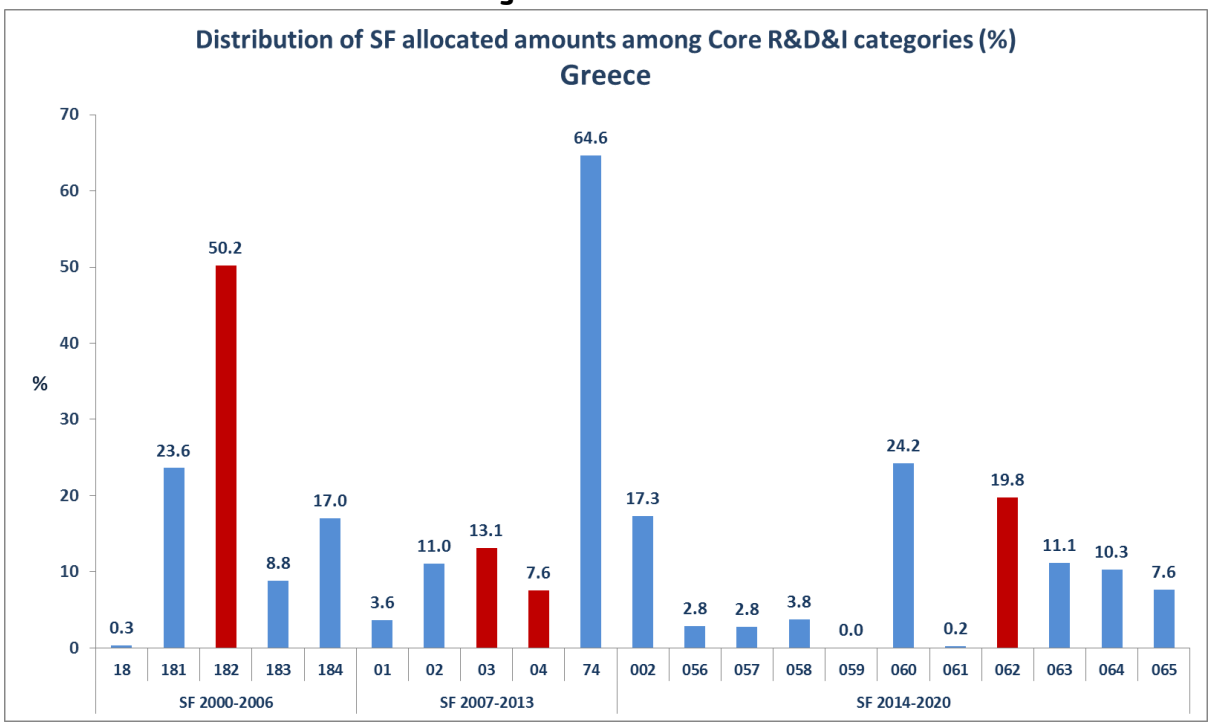

Figure 16 Structural Funds for core R&D activities 2000-2006, 2007-2013 and 2014-2020[247]. We use the categories: 182 (2000-2006), 03 and 04 (2007-2013) and 062 (2014-2020) as proxies for KT activities.

Greece has allocated 19.8% of its structural funds for core R&D activities to "Technology transfer and university-enterprise cooperation primarily benefiting SMEs" (compared to 50.2% for 2000-2006 and 18.7% in the 2007-2013 programming period). This is above the EU average of 15.7% in the current programming period (the EU average was 26.1% for 2000-2006 and 30.1% for 2007-2013).

247 Figure 16 provides the Structural Funds allocated to Greece for each of the above R&D categories. The red bars show the categories used as proxies for KT. Please note that the figures refer to EU funds and they do not include the part co-funded by the Member State. The categories for 2000-2006 include: 18. Research, technological development and innovation (RTDI); 181. Research projects based in universities and research institutes; 182. Innovation and technology transfers, establishment of networks and partnerships between business and/or research institutes; 183. RTDI infrastructures; 184. Training for researchers.
The categories for 2007-2013 include: 01. R&TD activities in research centres; 02. R&TD infrastructure and centres of competence in specific technology; 03. Technology transfer and improvement of cooperation networks; 04. Assistance to R&TD particular in SMEs; 74. Developing human potential in the field of research and innovation.
The categories for 2014-2020 include: 002. Research and Innovation processes in large enterprises; 056. Investment in infrastructure, capacities and equipment in SMEs directly linked to Research and Innovation activities; 057. Investment in infrastructure, capacities and equipment in large companies directly linked to Research and Innovation activities; 058. Research and Innovation infrastructure (public); 059. Research and Innovation infrastructure (private, including science parks); 060. Research and Innovation activities in public research centres and centres of competence including networking; 061. Research and Innovation activities in private research centres including networking; 062. Technology transfer and university-enterprise cooperation primarily benefiting SMEs; 063. Cluster support and business networks primarily benefiting SMEs; 064. Research and Innovation processes in SMEs (including voucher schemes, process, design, service and social innovation); 065. Research and Innovation infrastructure, processes, technology transfer and cooperation of enterprises focusing on the low carbon economy and on resilience to climate change.

Share of innovative companies cooperating with academia

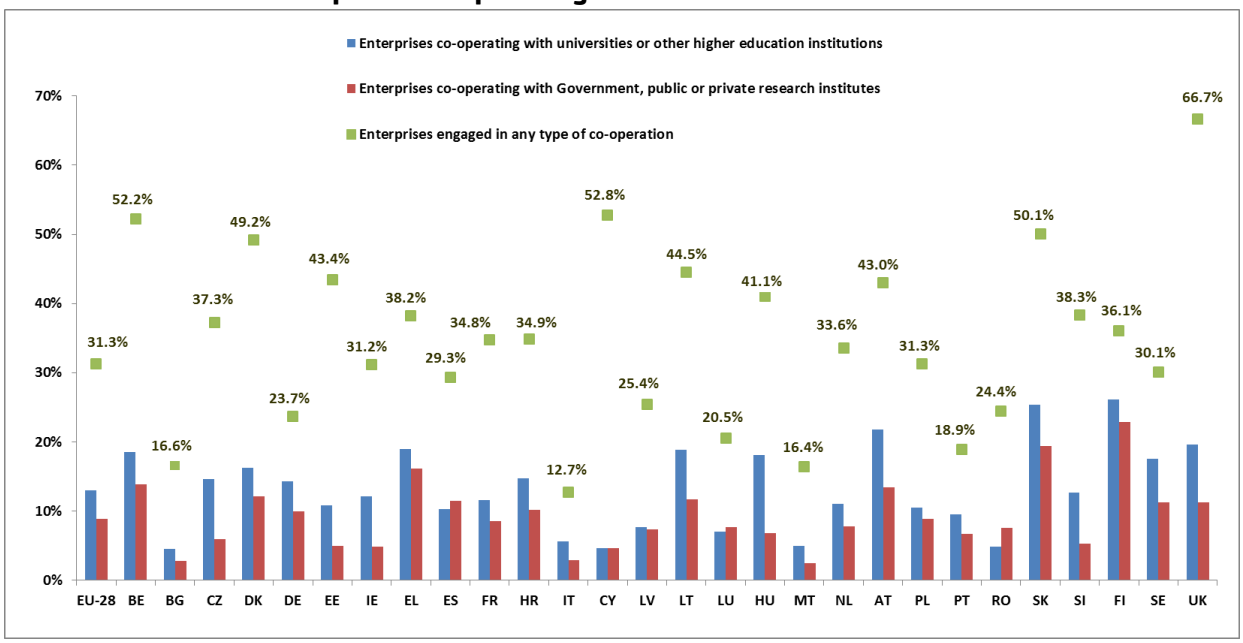

Figure 17 CIS survey 2012 – share of enterprises cooperating with academia

Figure 17 depicts the level of cooperation activities of innovative companies in the EU-28, according to the CIS 2012. The percentage of "enterprises engaged in any type of co-operation" (green dot) is on a medium level in Greece (38.2%), above the EU-28 average of 31.3%. The percentage of enterprises involved in cooperation with universities or other HEIs (blue bar) is 19%, whereas 16.1% cooperate with government, public or private research institutes (red bar). Both indicators are some way above the values of the EU-28 average, which are 13.0% and 8.9% respectively.

Technology Transfer Offices (TTOs), incubators and technological parks

Greece has three University Business Incubators and 6 Science and Technology Parks (Technology & Science Park of Attika "Lefkippos", Science and Technology Park of Crete, Thessaloniki Technology Park, Patras Science Park, Epirus Science and Technology Park and Lavrion Technological and Cultural Park). Technology Transfer Offices (called "Innovation Liaison Offices") exist in major Higher Education Institutions and in 64% of Public Research Organisations.

Share of public-private co-publications

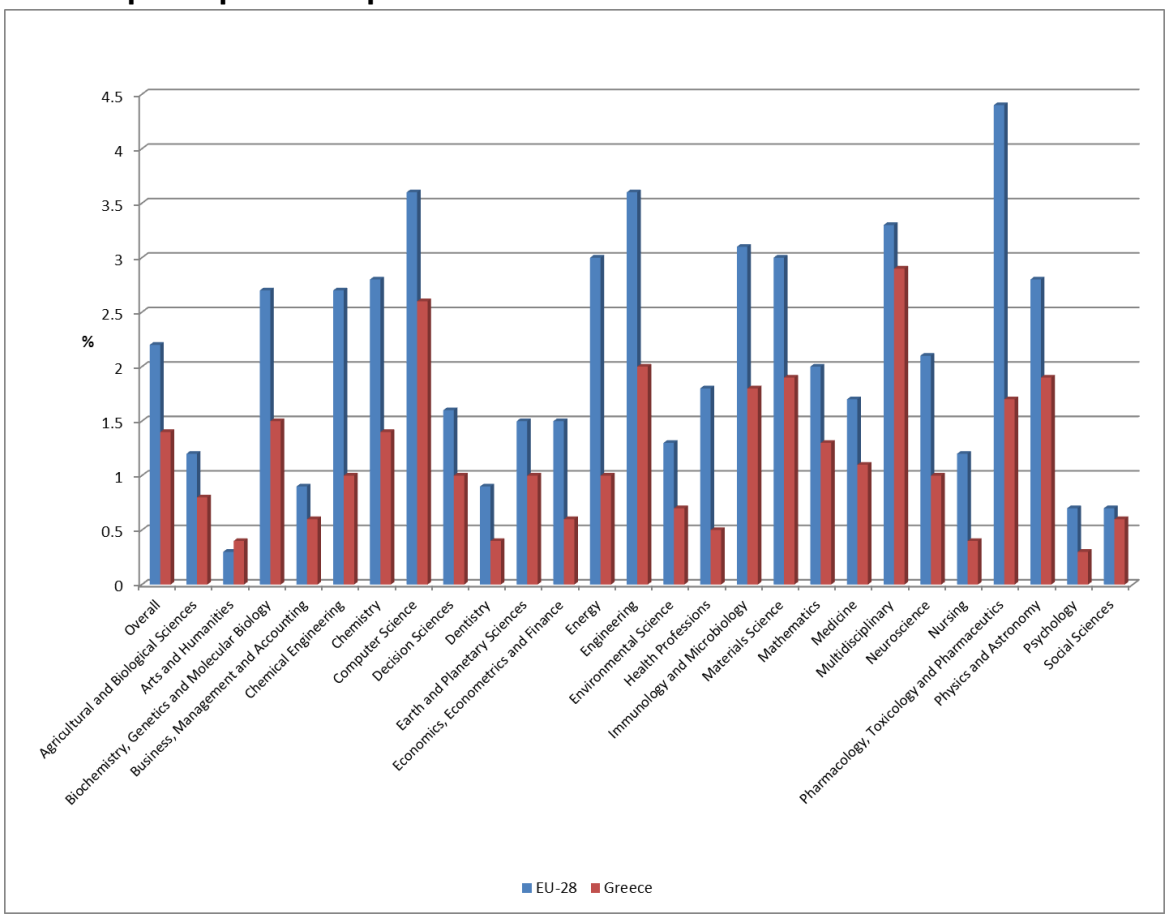

Figure 18 Co-publications by field 2003-2013 in Greece. Scopus database

Figure 18 shows the 2003-2013 average percentage of academia-industry co-publications by field in Greece compared to the European average. The total share of co-publications, displayed by the red "overall" bar on the left of the chart, is 1.4%, below the EU-28 average of 2.2%. Excluding multidisciplinary publications, the domains recording the highest share of co-publications are computer science, engineering, materials science, physics and astronomy, immunology and microbiology, and pharmacology, toxicology and pharmaceutics. Greece's share of co-publication is below the EU-28 average in all fields except arts and humanities.

With 24.4 co-publications per million population, Greece is somewhat below the EU-28 average of 29, as indicated by Scopus data.

Patenting activity of public research organisations and universities together with licensing income

The 2013 RTD Knowledge Transfer Study does not report indicators for Greece because there were fewer than 5 valid survey responses from Greek PROs.

Information on patent applications filed by HEIs and RPOs are scarce. In the period 1996-2010, HEIs accounted only for 1.6% of total patent applications (155) and 0.98% of granted patents (55). In half of the cases the applications were filed by spin-off companies with faculty members as direct or proxy equity investors. In the period 2009-2011, 310 patent applications were filed by RPOs and 168 by HEIs. Only 6 HEIs have procedures in place to deal with invention disclosures and their subsequent assessments[248].

[248] Greek Universities and Knowledge Transfer Performance: Assessment, Implications and Prospects, Conference

Companies

Between 2009 and 2011, there were 21 spin offs from RPOs and 27 from HEIs[249].

Table 1: Knowledge Transfer Outcomes of Greek HEIs (1996-2011)

	Spin-offs	Patent Applications	Active Patent Portfolio
Univ Thessaloniki (AUTh)	5	69	29
Univ Patras (UPatras)	4	42	17
Univ Athens (UoA)	6	23	4
Natl Tech Univ Athens (NTUA)	3	11	5
Univ Crete (UoC)	2	8	4
Univ Thessaly (UTh)	4	1	1
Athens Univ Econ Bus (AUEB)	2	0	0
Agr Univ Athens (AUA)	1	0	0
Univ Thrake (DUTh)	0	9	0
Tech Univ Crete (TUC)	0	3	1
Univ Ioannina (UoI)	0	1	0
Univ Aegean (UAegean)	0	1	0
Public Research Centres	21	310	165

Figure 19 Number of Spin-offs per university together with their patenting portfolio[250]

The business sector's labour demand for researchers seems to be weak. A survey for an ERAC Mutual Learning Workshop on Human Resources and Mobility found that academics in Greece very often have problems in finding jobs outside HEIs[251]. Within the ERA compliant cluster[252], there is no research personnel whose primary occupation is in the private sector.

5.7.2 Policy Measures

The Operational Programme Life Long Learning provided for innovation and entrepreneurship units in HEIs in all regions and implements the establishment of Innovation and Liaison Offices (ILOs). ILOs support the registration of Intellectual Property Rights (IPR) of HEIs and their academic staff, promotes collaborations between academia and the industry, provide career orientation to students and graduates, and organise innovation and entrepreneurship initiatives within the HEI research community.

The PRAXI/HELP-FORWARD Network of the Foundation for Research and Technology Hellas (FORTH) support the development of research collaborations between the public and private sector and exploitation of scientific results. It is supported by the Hellenic Federation of Enterprises and the Federation of Industries of Northern Greece. The network provides information, mediation and advisory services to all stages of Technology Transfer and Exploitation of Research Results (funding, detection of technological needs, technology search and evaluation, partner search and support in technology transfer negotiations)[253].

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proceedings, (Karra S., Tolias Y., September 2012)

[249] Data from WIPO Statistics Database (WIPO 2011) deducted from Karra S., Tolias Y., Greek Universities and Knowledge Transfer Performance: Assessment, Implications and Prospects, Conference proceedings, September 28th 2012

[250] Greek Universities and Knowledge Transfer Performance: Assessment, Implications and Prospects, Conference proceedings, (Karra S., Tolias Y., September 2012)

[251] Report from the 2014 ERAC mutual learning workshop on Human Resources and Mobility, Intersectoral Mobility, (Vandevelde K., March 2014)

[252] 22 RPOs in Greece answered the 2014 ERA survey, which represents 15.3% of the total number of researchers in the country (total number of researchers in the country as of 2011) -30.0 % of them are in the 'ERA compliant' cluster

[253] https://www.forth.gr/index_main.php?l=e&c=8, December 2014

A number of support programmes managed by the General Secretariat for Research and Technology count knowledge transfer among their objectives, including PAVET, the Hellenic Mobile Cluster Programme, Innovation Vouchers for SMEs, COOPERATION, Creation, and an instrument that provides support to enterprises for recruiting high-level scientific personnel[254].

Metavallon is a non-profit volunteer organisation providing incubator facilities (45 working spaces) to 10 teams. The programme includes 3 stages: the 2-months "Gymnasium" for developing ideas, the 6-8 months accelerator "Academy", and the 2 years incubation "Institute". Metavallon offers training, coaching, mentorship, networking, a one-month start-up mission to San Francisco and the Silicon Valley, and €25,000 in pre-seed funding in exchange for an 8% equity stake for its investing partners[255]. The venture fund Jeremie Odyssey Venture Partners, which is co-finance by JEREMIE funds, has invested in Metavallon[256].

THEA, an incubator for start-up companies was launched in 2014 by the Athens Chamber of Commerce and Industry, aiming to provide administrative support, ad hoc consulting and networking to about 50 business ventures for a period of 18 months[257]. The project is part of the "Athena Plan" and is financed by structural funds (Operational Programme Attica)[258].

The National smart specialisation strategy includes plans to support knowledge transfer, which are supposed to be operationalised through the OP Competitiveness and Entrepreneurship. Planned measures include the funding of spin offs (€100m provided by ERDF); incubation services to start-ups, seed companies, and for employing scientists and researchers (€345m provided by Structural Funds); innovative clusters for collaboration between academia and businesses (€300m, funded by ERDF and EAFRD); and a programme for the support of RTDI collaboration between PROs, HEIs and businesses for the production of innovative products and processes (€255m provided by ERDF, EMFF and EAFRD)[259].

5.7.3 Assessment

Greece has introduced a set of policy measures on KT, but without a coordinating strategy. The lack of coherence and resultant fragmentation of KT policies may hamper the effectiveness of existing policy measures. The JRC Knowledge Transfer Study cites unidentified stakeholders stating that "KT in Greece has taken place despite rather than because of policy intervention" [260]. This being said, the national smart specialisation strategy adopted in summer 2015 outlines KT support measures and positions them within a context of regional development, which could be a starting point for a more coherent and ambitious KT policy framework. However, concerning the KT support measures envisaged by the smart specialisation strategy, it seems doubtful whether the relatively high indicative budgets of individual instruments will be actually reached, especially given their strong reliance on co-financing from Structural Funds.

Given the business sector's low demand for research-based knowledge, policy measures should also focus on further stimulating this demand. This is likely to prove difficult in the shorter term given the low solvency of most Greek companies and a critical supply shortage of funding for risky investments. Moreover, the current legal framework hampers researchers' intersectoral mobility.

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[254] Tsipouri and Athanassopoulou (2015) RIO Country Report Greece 2014
[255] http://www.metavallon.org/, December 2014
[256] http://www.startupgreece.gov.gr/content/jeremie-openfund-ii-spring-2014-call-proposals-0, December 2014
[257] http://www.ekt.gr/content/display?ses_mode=rnd&ses_lang=el&prnbr=89389, December 2014
[258] http://www.theathensincube.gr/pages/activity, December 2014
[259] National R&I Strategy for Smart Specialisation 2014-2020, General Secretariat of Research and Technology, Annex 1, Detailed description of actions, pg. 16-17
[260] European Commission (2013) Knowledge transfer study 2010-2012 Final Report, p. 251

The Presidential Decree 17/2001 and the programme Praxe-B have improved Greek performance in terms of spin-off establishment and patenting activity, demonstrating the potential of academia for research results commercialisation.

5.8 Regulation and innovation

In Greece, there are no policy actions assessing the impact of regulation on innovation.

5.9 Assessment of the framework conditions for business R&I

Framework conditions are not really favourable to business investment in R&I: autonomy of HEIs is limited, the intervention of the state is often made based on budget allocations and not development criteria, the R&I policy cycle is not smooth with rationales, monitoring and evaluation is suffering and financial incentives are occasionally mis-managed in their delivery.

The new RTDI Law 4310/2014 set up specific conditions for the enhancement of research and innovation. The Law provided the framework for the funding of spin offs for RTDI (Art. 26) and the award of innovation prizes to RPOs, HEIs, the business sector (Art. 27). It will further be enhanced by the new RTDI law which is expected in the first semester of 2016.

Policies are supply driven. Demand-side measures have only been adopted in the form of consumer subsidisation for energy efficiency but this has only supported diffusion and no new technology creation. Demand-side policies in the form of public procurement for innovation are envisaged for the first time in the programming period 2014-2020 and have been included in the national RIS3.

6. Conclusions

This chapter provides an assessment of the performance of the national research and innovation system and identifies the main structural challenges faced by the national innovation system.

6.1 Structural challenges of the national R&I system

The national innovation system is characterised by inefficient governance mechanisms, a significant failure to prioritise objectives for funding, and a lack of business demand for new knowledge and focus on R&D. In addition to those main challenges that are also discussed in more detail in the executive summary above, the system suffers from a misalignment in supply and demand of R&D human resources, in particular researchers, and an imbalanced development of innovation priorities at the regional level..

Improve governance of the national innovation system

The lack of efficient monitoring mechanisms and of systematic evaluation has hindered policy learning and did not allow improvements in the design and implementation of policies. Most striking was the total absence of systematic surveys until 2013, leading to lack of evidence to support effective policy-making.

Despite the urgent need for improvements at all levels of governance, budget cuts and reductions of personnel represent disincentives to improvement, while at the same time tensions within the existing organisational structures are increasing.

The concentration of design and implementation of R&D policy within a single agent (GSRT) has been repeatedly criticised (Tsipouri and Papadakou, 2005). Furthermore, the positioning of GSRT under the auspices of the Ministry of Education, Research and Religion makes the coordination of innovation policies with other bodies and Ministries difficult.

Ensure better-focused and long term public funding of R&D, and facilitate access to funding of SMEs

Funding depends on Structural Funds and efforts of absorption dominate. Exacerbated by the crisis, R&I funding is more oriented towards solving liquidity problems than towards addressing R&I performance and long-term challenges. At the operational level, complex administrative rules, inefficient management structures, and low administrative capacity inhibit the consistency of competitive funding. Grant et al (2011) list several cases where funding decisions were delayed or committed research funds were not paid on time. This resulted e.g. in competitive funding for the period 2007-2008 being virtually zero (Maroulis, 2011).

As the design and management of the Structural Funds is complex and the management capacity of the Greek administration is limited, the dependence on Structural Funds has resulted in fragmented planning and budgets being allocated to various sectoral and regional Operational Programmes. In addition, absorption rather than impact is in general the dominant funding decision criterion. This leads to a vicious circle between chasing funds and neglecting priorities. For years the lack of priorities and the scarcity of public funding have created an opportunistic supply driven research system (Bartzokas, 2007). This system often followed the general priorities of the EU Framework Programmes (Grant et al, 2011), which were not always related to the needs of the country. Even worse, lack of focus has hindered the creation of economies of scale and of national relevance and importance in research areas (Grant et al, 2011). The current debt crisis and the severe budget cuts increase the importance of consolidated and targeted funding towards few and well-defined priority areas.

Lack of business demand for R&D and new knowledge

BERD as a percentage of GDP was at 0.27 at the end of 2013, compared to 0.24 in 2012, and slightly over 20% of the EU-28 average (1.3%)[261]. In addition, the absolute number of employers is shrinking (38.4% decrease in the period 2008-2013).

The lack of demand from the business sector, coupled with the lack of funding were principal barriers to innovation, after price competition[262]. Greece is a moderate innovator with innovation output indicator at 76.3, compared to an EU 28 average of 101.6 (2012 data)[263].

The demand for research-based knowledge from the private sector has remained very low even in sectors with relatively high innovation performance; the latter focusing their innovation efforts mainly on non-R&D and non-technological aspects such as marketing and organisational improvements. The low share of manufacturing (just below 10% of GDP) and the reduced liquidity of the banking sector are both likely to further reduce research-based innovation. Access to finance was reported to be the most pressing problem for 42% of Greek SMEs, which reported the highest increase in their needs for financing (30%) in the euro area[264]. The lack of liquidity of the banking sector resulted in only 15% of the SMEs applying for bank loans[265]. In such a situation, RTDI expenditure is among the first budget positions to be reduced.

With limited and reducing demand for R&D, two major challenges for public policy are creating a stable macro-economic environment that will trigger investments in technology that need a longer term horizon to amortise; and eliminating factors that hamper innovation/entrepreneurship (such as bureaucracy that turns away SMEs), to attract ambitious companies, and minimise crowding-out.

Align supply and demand of human resources

According to Lianos (2007) and Lambrianidis (2011), there is a mismatch between supply and demand of human resources. This misalignment can be attributed to both the insufficient demand of R&D from the private sector and the non-responsiveness of the education system to the market needs. Lambrianidis (2011) argues that the overabundance of highly educated individuals relative to the overall demand is due to the low demand from the private sector for highly qualified personnel.

Supply of skilled and medium-skilled labour increased more rapidly than demand in the decade 2000-2010 and it is expected to further increase more rapidly than demand in the current decade. A deceleration of demand, and to a lesser extent supply, for highly/medium skilled employees is expected in the period 2010-2020[266].

The challenge for public policy is to increase the responsiveness of the higher education system to the needs of the economy and to increase the demand from the private sector for highly qualified personnel.

The alignment will suffer from the emerging brain-drain, which has become manifest after the outbreak of the crisis. As pointed out, the emigration trends of both young and experienced scientists are growing out of proportion. If austerity policy continues affecting research expenditure (both salaries and infrastructure) the demand for RTDI high quality skills will be hard to cover in the future, possibly affecting the implementation of RIS3.

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[261] Eurostat, Total intramural R&D expenditure (GERD) by sectors of performance

[262] Innovation in Greek companies 2010-2012, National Documentation Centre, 2015

[263] European Commission, Research and Innovation Performance in the EU, Innovation Union progress at country level, 2014, pg. 131

[264] Survey on the access to finance of small and medium-sized enterprises in the euro area , October 2013 to March 2014, (European Central Bank, April 2014),

[265] Ibid.

[266] Innovation Union Competitiveness Report 2013, pg. 64

Reduce regional disparities in R&D and innovation performance

Greece presents large disparities among its regions, both at economic and at R&D level. HRST/total employment in Attica is above Greek average (43.6 over 34.0). High numbers are also observed in Central Macedonia (33.3%) but also in North Aegean (33.9%), which accounts only for 1% of GERD[267].

The existence of disparities presents a problem in research and innovation policy since some regions may not be able to undertake appropriate actions although acknowledged as areas with competitive advantages by RIS3 (i.e. Western and Central Macedonia for agriculture, some island of Northern Aegean for tourism etc.).

Attica has the highest population with tertiary education (36.3%), followed by Central Macedonia (27.3%) and Thessalia (26.3%), against an average of 28.1% for Greece. Ionian Islands have the lowest population with tertiary education (17.7%) (2014 data)[268]. In terms of R&D personnel, Crete and North Aegean come first with 2.2% and 2.09%, respectively of R&D population to total active population. Attica has 1.54% of R&D personnel, slightly above the Greek average of 1.41%, while Ionian Islands (18.1%) have the smallest percentage of R&D personnel to total (0.23%) (2011 last available data)[269].

In terms of R&D expenditure, Attica has the highest GERD per capita expenditure of €194.1, followed by Crete (€169.2) and Ipeiros (€110.7) compared to a Greek average of €125.1 and the lowest GERD per capita expenditure of € 13.9 recorded in Ionian Islands (2011 last available data)[270]. Attica, Central Macedonia and Crete accounted for 77% of GERD in 2011[271].

In terms of innovation, things are improving and all Greek regions seem now to converge and qualify as moderate innovators[272]. Based on a survey conducted by the NDC in a sample of Greek companies[273] in the period 2010-2012, Crete records the highest number of innovative companies as a percentage of total companies (65.2%), followed by Sterea Ellada (56%), Attika (54.3%) and the Region of Central Macedonia (53%)[274].

In terms of EU funding, Attica and Central Macedonia received the bulk of funding in the period 2007-2013. Limited funding was received by Ionian Islands[275].

Challenges	**Justification**
1. Improve governance of the national innovation system	- Lack of efficient monitoring mechanisms and of systematic evaluation - Lack of systematic surveys until 2013 - At the operational level, complex administrative rules, inefficient management structures, and low administrative capacity
2. Ensure better-focused and long term public funding of R&D	- Funds from abroad provide over 13% of total R&D funding - Absorption rather than impact is in general the dominant funding criterion - Access to finance was reported to be the most pressing problem for 42% of Greek SMEs

[267] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, pg. 53
[268] Eurostat, Persons aged 25-64 with tertiary education attainment, by sex and NUTS 2 regions (from 2000 onwards) - % (edat_lfse_11)
[269] Eurostat, Total R&D personnel and researchers by sectors of performance, sex and NUTS 2 regions (rd_p_persreg)
[270] Eurostat, Total intramural R&D expenditure (GERD) by sectors of performance and NUTS 2 regions (rd_e_gerdreg)
[271] National Strategy of Research and Innovation for Smart Specialisation 2014-2020, pg. 48
[272] European Commission, Regional Innovation Scoreboard 2014, pg. 47
[273] 14,987 Greek companies with employees>10 people from the industry and services sector
[274] Innovation in Greek companies 2010-2012, National Documentation Centre, 2015, pg. 11
[275] Expert evaluation network delivering policy analysis on the performance of Cohesion policy 2007-2013, Year 3 – 2013, Task 2: Country Report on Achievements of Cohesion policy, Greece

Challenges	Justification
3. Increase business demand for R&D and new knowledge	- Low BERD/GDP ratio slightly over 20% of the EU28 average - Innovation output at 90 below EU average
4. Align supply and demand of human resources	- Supply of skilled and medium-skilled labour increased more rapidly than demand in the decade 2000-2010 and it is expected to further increase more rapidly than demand in the current decade. - A deceleration of demand, and to a lesser extent supply, for highly/medium skilled employees is expected in the period 2010-2020
5. Reduce regional disparities in R&D performance	- Attica has the highest GERD per capita expenditure followed by Crete and Ipeiros - Attica and Central Macedonia received the bulk of EU funding in the period 2007-2013

6.2 Meeting structural challenges

Improve the governance of the national innovation system

A number of initiatives were undertaken by the government at the end of 2013 to improve the governance of the national innovation system. First, a systematic surveying and publication of RTDI data was organised to support evidence-based policies. Second, an Innovation Council was established in December 2013, with the joint participation of academics and the industry, as an advisory and coordinating body for the promotion of innovation policy. The Council will recommend innovative measures to the government and will act as a contact point between the businesses and the scientific community and the government[276].However, this Innovation Council did not pick up.

Law 4310/2014 introduced a new R&I structure, with a RTDI Coordinating Committee between the government, GSRT and NCRTDI for the monitoring and coordination of all R&D government efforts. The law foresees also the support of GSRT by Disciplinary Science Councils (DSC). The same law created the National Council of Research and Innovation. This structure was not implemented and will change again with the new RTDI law.

The role of Alternate Minister of Education, Research and Religion, entrusted with RDI policy, as well as the creation of R&I sector provided better orientation and focus.

Finally, changes were introduced to the funding mechanism of NSRF in the new programming period (2014-2020)[277].

Evaluation remains a significant weakness: the only evaluation launched in recent years by the GSRT started in 2014 and results are not expected until mid-2015.

Ensure better-focused and long term public funding of R&D

In order to ensure better-focused of public funding of R&D, the Greek government considered the findings of studies conducted by McKinsey and the Foundation of Economic and Industrial Research on entrepreneurship, competitiveness and extroversion in Greece and set up the priorities of the new NSRF (2014-2020) in areas where Greece has a comparative advantage, namely Tourism, the Agricultural sector, Logistics, Environmental industry, Health , Energy production and savings, materials, ICT and Creative industries and Culture. McKinsey estimates that a total investment of about €110b in these sectors could have an added value of €48b and create 640,000 new jobs by 2020[278].

[276] http://www.mindev.gov.gr/?p=13184, December 2014
[277] http://www.mindev.gov.gr/?p=13166, December 2014
[278] New NSRF, (2014-2020), Priorities and Architecture, Ministry of Development and Competitiveness, December 9th

The National R&I Strategy endorsed the same sectors for Smart Specialisation 2014-2020 (RIS3), approved by the Greek Parliament in August 2015 (FEK 1862/B/27.8.2015). The National Strategy for Research Infrastructures prioritises the creation of a critical research mass in areas of strategic importance for Greece.

The success of these initiatives will depend largely on the mobilisation of the Regional Research and Innovation Councils (RRIC) created by Law 4310/2014 and the role that they will undertake in the design of RDI policy through their liaisons with GSRT. The governance scheme and the monitoring mechanism of the national RIS3 will also be decisive.

Increase business demand for new knowledge

Supply- and demand-side policies co-evolve through the implementation of initiatives such as "Innovation Expert-Innovation in Action", INNOVATHENS, the signing of a partnership agreement between GSRT and HFE for RTDI and the establishment of Si-cluster and Gi-Cluster (see Chapter 5.2). However, demand-side support remains significantly less pronounced than supply-side support.

In addition, there is a number of initiatives planned in the national RIS3, including support and incubation services to start ups, seed companies, the establishment and development of innovative start-ups, the support of innovative cluster projects through collaborations between academia and businesses and the support of RTDI collaborations between RPOs, HEIs and businesses for the production of innovative products and processes (see Chapter 3.5.1 above).

Finally, there is a surge of incubators funded mostly by the private sector (see Chapter 5.7). Other related programmes in the previous programming period included Collaboration (2009-2015), 'Support for R&D in new firms' (2009-2015), 'Support for R&D in groups of small and medium-sized enterprises (SMEs)' (2009-2015), New Innovative Entrepreneurship (2011-2015) , Creation (2009-2015) and PAVET 2013 (see Chapter 3.5.1 above).

The success of these programmes will ultimately depend on the improvement of the macroeconomic climate in Greece and the enforcement of the restructuring of the RTDI sector.

Law 4310/2014 (Art.26) provides for the creation of a specialised office within GSRT which will support patenting. The national RIS3 provides for the establishment of a Patent Pool Fund for the commercialisation of research ideas and results (see Chapter 3.5.2 above).

Align supply and demand of human resources

The misalignment in skilled employment has widened because of the massive unemployment-affecting graduates, in particular young ones. It is estimated that about 200,000 new researchers have left Greece in the period 2010-2015, 10% of the available research potential of the country, and 2% of the overall population.

The ATHENA plan is expected to reduce the misalignment of skills; however, as long as there is no real decentralisation and the Ministry of Education, Research and Religion continues to impose quotas in all departments across the country, improvements are unlikely.

The Ministry of Education, Research and Religion created through the Operational Programme Life Long learning innovation and entrepreneurship units in HEIs and enforced the operation of Liaison Offices and Training Centres. This programme will further be enhanced in the period 2014-2020 with a budget of € 13.9 m (see Chapter 5.2).

2013

The Ministry of Education, Research and Religion is encouraging the introduction of entrepreneurship courses in the university curricula, especially in the economics and engineering departments. In addition, offices are established in universities and polytechnics (budget of €101m) that combine career development counselling activities with the promotion of business planning competitions, creation of entrepreneurship clubs, and development of courses on entrepreneurship. Law 4009/11 foresees that these offices will become an official unit within the institutional organigramme.

The national RIS3 foresees an initiative for the support of innovative cluster projects through collaborations between academia and businesses. Funding can take the form of subsidies or innovation coupons.

Law 4009/2011 (Art 2011) introduced the idea of scientific leaves enabling researchers to engage in research abroad for one year if researchers have been employed for a period of at least 6 years or 6 months for a total employment of at least 3 years.

These initiatives are expected to increase the supply of specialised human resources. At the same time the crisis has decreased demand, hence the gap between demand and supply is diminishing.

Reduce regional disparities in R&D and innovation performance

The Ministry of Education, Research and Religion has defined Zones of Educational Priority (ZEP) in areas with low total education indicator, high school drop-outs percentages and low university accession percentages, as well as low socioeconomic indicators. In ZEP initiatives will be undertaken for the enhancement of the learning curve of pupils (i.e. summer courses, reception courses, lessons in the mother language of the pupils when foreigners)[279].

Regional Smart Specialisation Strategies for the 13 regions were prepared by a team of international and Greek experts and were released in September 2013, identifying research priorities for each region, taking into account a comprehensive analysis of the regional innovation landscape (SWOT analysis). All strategies were adopted in 2015 and calls for proposals for pilot projects have been launched.

In preparation of the new programming period 2014-2020, measures are examined to enhance the demand of research and innovation services by Regional Authorities, as well as to boost the role of the research centers in regional development[280]. The new NSRF (2014-2020) foresees 13 Regional Operational Programmes and the management of 35% of total funds by Regional Authorities, compared to 22% in the former programming period[281]. The role of Regional Research and Innovation Councils are expected to be enhanced in the new RTDI Law.

[279] Greek National Reforms Programme, April 2013, Ministry of Finance, pg. 26
[280] Greek National Reforms Programme, April 2013, Ministry of Finance, pg. 52
[281] New NSRF, (2014-2020), Priorities and Architecture, Ministry of Development and Competitiveness, December 9th 2013

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Abbreviations

	ENGLISH NAME	NATIONAL NAME
BERD	Business Expenditures for Research and Development	-
CERN	European Organisation for Nuclear Research	-
ERA	European Research Area	-
COST	European Cooperation in Science and Technology	-
EAFRD	European Agricultural Fund for Rural Development	-
EMFF	European, Maritime and Fisheries Fund	-
ERA-NET	European Research Area Network	-
ERC	European Research Council	Ευρωπαϊκό Συμβούλιο Έρευνας
ESA	European Space Agency	-
ESETAK	Technological Development and Innovation	Εθνική Στρατηγική Έρευνας, Τεχνολογικής Ανάπτυξης και Καινοτομίας
ESFRI	European Strategy Forum on Research Infrastructures	-
ESM	European Stability Mechanism	Ευρωπαϊκός Μηχανισμός Σταθερότητας
EU-28	European Union including 28 Member States	Ευρωπαϊκή Ένωση 28 Χωρών Μελών
FDI	Foreign Direct Investments	Άμεσες Ξένες Επενδύσεις
FP7	7th Framework Programme	7ο Πρόγραμμα Πλαίσιο
FP6	6h Framework Programme	6ο Πρόγραμμα Πλαίσιο
GBAORD	Government Budget Appropriations or Outlays on R&D	-
GCI	Global Competitiveness Index	-
GDP	Gross Domestic Product	Ακαθάριστο Εθνικό Προϊόν
GERD	Gross Domestic Expenditure on R&D	Ακαθάριστη Εγχώρια Δαπάνη Έρευνας και Τεχνολογικής Ανάπτυξης
GOVERD	Government Intramural Expenditure on R&D	-
GRNET	Greek Research and Technology Network	Εθνικό Δίκτυο Έρευνας και Τεχνολογίας
GSRT	General Secretariat of Research and Technology	Γενική Γραμματεία Έρευνας και Τεχνολογίας
GUF	General University Funds	-
HEI	Higher education institutions	Ανώτερα Εκπαιδευτικά Ιδρύματα
HERD	Higher Education Expenditure on R&D	Δαπάνη Έρευνας και Τεχνολογίας Ανώτερων Εκπαιδευτικών Ιδρυμάτων
HFE	Hellenic Federation of Enterprises	Σύνδεσμος Ελληνικών Βιομηχανιών
HPC	High Performance Computer	Υπολογιστής Υψηλής Απόδοσης

HQA	Hellenic Quality Assurance and Accreditation Agency	Αρχή Διασφάλισης και Πιστοποίησης Ποιότητας στην Ανώτατη Εκπαίδευση
IfG	Institution for Growth	Ελληνικό Επενδυτικό Ταμείο
ILO	Innovation and Liaison Offices	Γραφεία Διασύνδεσης και Καινοτομίας
IPR	Intellectual Property Rights	Δικαιώματα Πνευματικής Ιδιοκτησίας
JRC	Joint Research Centre	-
KTO	Knowledge Transfer Office	Γραφεία Μεταφοράς Τεχνογνωσίας
NAGREF	National Agricultural Research Foundation	Εθνικό Ίδρυμα Αγροτικής Έρευνας
NCRT	National Council for Research and Technology	Εθνικό Συμβούλιο Έρευνας και Τεχνολογίας
NCRTDI	National Council for Research. Technology Development and Innovation	Εθνικό Συμβούλιο Έρευνας. Τεχνολογικής Ανάπτυξης και Καινοτομίας
NDC	National Documentation Centre	Εθνικό Κέντρο Τεκμηρίωσης
NSRF	National Strategic Reference Framework	Εθνικό Στρατηγικό Πλαίσιο Αναφοράς
OECD	Organisation for Economic Co-operation and Development	Οργανισμός Οικονομικής Συνεργασίας και Ανάπτυξης
OP	Operational Programme	Επιχειρησιακό Πρόγραμμα
PA	Partnership Agreement	Σύμφωνο Εταιρικής Σχέσης
PIP	Public Investment Programme	Πρόγραμμα Δημοσίων Επενδύσεων
PPP	Public Private Partnership	Συμπράξεις Δημόσιου-Ιδιωτικού Τομέα
PSCTA	Permanent Special Committee on Technology Assessment	Μόνιμη Ειδική Επιτροπή Τεχνολογικής Αξιολόγησης
R&D	Research and Development	Έρευνα και Ανάπτυξη
RPO	Research Performing Organisations	Ερευνητικά Ιδρύματα
RTDI	Research Technological Development and Innovation	Έρευνα. Τεχνολογική Ανάπτυξη και Καινοτομία
SF	Structural Funds	Κεφάλαια Διαρθρωτικών Ταμείων
SFIC	Strategic Forum for International Science and Technology Cooperation	-
SME	Small and Medium Sized Enterprise	Μικρομεσαίες Επιχειρήσεις
S&T	Science and Technology	Έρευνα και Τεχνολογία
TEI	Technical Education Institutions	Τεχνολογικά Εκπαιδευτικά Ιδρύματα
UAT	University Autonomous Tool	-
VC	Venture Capital	Κεφάλαια Επιχειρηματικών Συμμετοχών

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Annex 1 – List of the main research performers

	Public Research Performers	Number of publications 2008-2012	Number of citations 2008-2012
1	National and Kapodistrian University of Athens	12.558	79.925
2	Aristotle University of Thessaloniki	9.492	45.298
3	University of Patras	5.004	24.208
4	National Technical University of Athens	4.454	19.457
5	University of Crete	4.231	30.031
6	University of Ioannina	3.833	26.824
7	University of Thessaly	2.582	11.276
8	National Center for Scientific Research "DEMOKRITOS"	2.255	15.255
9	Foundation for Research and Technology Hellas	2.210	19.675
10	Democritus University of Thrace	2.130	7.726

Source: Sahini E., Malliou N., Housos N., Karaiskos D. (2014), Greek Scientific Publications 1998-2012: Bibliometric Analysis of Greek Publications in Academic Scientific Journals – Web of Science, National Documentation Centre

	Private Researcher Performers	R&D expenditure 2014 (€m)	R&D intensity (%)
1	Pharmathen	45.1	25.0
2	Intralot	17.9	1.0
3	Kreta Farm	7.2	6.8

Source: EU Industrial R&D Investment Scoreboard 2015

Annex 2 – List of the main funding programmes

Name of the funding programme	Timeline	Budget	Target group
Thales	2009-2015	120,000,000	Researchers
Archimedes III	2009-2015	101,000,000	TEI
Aristeia II		61,000,000	Researchers
Heraclitus II	2010-2015	39,600,000	Researchers

Annex 3 – Evaluations, consultations, foresight exercises

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